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Rules and Regulations

OUR correspondence files give proof of the bewilderment prevailing among contractors and others concerned in installation work.

Dissatisfaction is expressed on account of the different standards prevailing in different areas rather than of the arbitrary character of some of them.

The supply engineer himself is in a difficult position, for the only guidance given him comes from the statutory requirements that he must be reasonably satisfied that the connection of an installation will not cause a leakage exceeding one-thousandth part of the maximum supply current to the premises, and that it will not affect the supply to other consumers.

Supply engineers have in many cases probably read a good deal more into the powers thus conferred upon them than they are strictly entitled to do, but on the whole the stipulations have been in the interests of the consumers and also of the contractors in the long run. Nevertheless, such regulations represent, as we have said, individual views only, and the position of the supply engineer in his endeavours to enforce them rests upon insecure foundations.

The manufacturer of electrical apparatus is likewise a victim of the present confused situation. This is reflected in the annoyance felt by the consumer who, having paid an additional amount for his house to be wired in accordance with the I.E.E. Regulations, finds that appliances subsequently purchased do not make full compliance with these regulations possible.

The West Ham undertaking is, we believe, the only one that has acquired powers to enforce wiring regulations, and it has chosen a code that is based upon collective experience—the I.E.E. Regulations. Objections have been raised to these Regulations on the grounds of the expense of the high standard required and of the earthing provisions.

As regards the first, West Ham is not a rich man's area, but the Regulations work well there (see Mr. Townley's article in our issue of July 18th, 1930). The desirability of earthing certain apparatus meets with opposition from many quarters, and some latitude in interpretation might well be permitted.

Nevertheless, the I.E.E. Regulations hold the field, and are recognised as the desirable standard by outside authorities. Thus the Fire Offices Committee of London adopted them in 1926, and recently the senior coroner for London has recommended that they should be made compulsory for all new buildings in the City. It is, however, one thing to have an agreed standard and another to apply it in practice. The Electricity Commissioners can call upon any undertaking to standardise its supply; this may involve changing over from d.c. to a.c. or raising the a.c. voltage. It is only logical that they should have powers to ensure the safety that comes from sound installation work.

The Commissioners are permitted to impose upon supply undertakings such regulations as they may consider expedient for securing the safety of the public from personal injury, or fire, or otherwise. Have they used their existing powers as far as they lawfully can with regard to the consumers' premises? If so, we suggest that the need for standard wiring conditions is great enough to justify the requisite amendment of the Electricity Supply Acts.

"Jerry" Wiring

THIS euphonious term is freely used in the proceedings of the Electrical Contractors' Association, whose members have always suffered from the unfair competition which is suggested. It now appears that the Association is taking steps to discover some of the people who are responsible for unreliable and dangerous installation work with a view to bringing actual examples of their misdoings before the responsible authorities. This is a thing which badly needs attention, and we trust that the E.C.A.'s efforts will be crowned with success in the form of some sort of supervision or control. Already the Executive Committee of the National Register of Electrical Installation Contractors is doing something of the kind, but its activities are perforce confined to those who are registered. It is chiefly among the unregistered and "unassociated" that the "jerry" wiremen are to be found, however, and the existence and objects of the Register and the Association are so little known to the general public that regulations have become very necessary.

What is Saturation?

WHAT do electricity supply men mean when they use the term "Saturation"? If we were to con a map of an area and note from the red route indications that the mains were laid everywhere, we should know that supply facilities, at any rate for lighting, were within reach of the public. But if we found that only a few houses in some of the streets were taking a supply we should think less of the state of development. Even should we find that a service line had been laid into every house we shouldn't feel justified in using the word saturation. We have got into the way of using the term too lightly—we believe it originally came from America—perhaps to comfort ourselves in some cases with the thought that we are getting on so well. But no area in the country is *saturated* electrically in the proper meaning of the word. The dictionary defines it as the state of becoming completely penetrated, filled fully, or soaked. Such a description does not apply until electric lighting is used in every room in a house, and until many domestic points have electrical appliances attached to them giving good service to the householder, while motors are humming in the factories that lie within the area. No! We have a long way to go before any area will be really saturated. Even the City of London and contiguous districts are not yet served as fully as they could be. For example, how many consumers have been canvassed to see whether they are using all the electric fires that might advantage them, or whether they have all the fans and kettles that might make office life more congenial?

An Optimist's Forecast

THAT Brig.-Gen. Legge is a whole-hogger or nothing is very plain from the closing paragraphs of his article on "Electricity is Good for You!" appearing on page 58. He suggests a co-operative scheme in which the Central Electricity Board shall throw in its lot with the E.D.A., and he holds that £200,000 is not too much for the supply industry to spend annually on national publicity propaganda. With an optimism that is not opposed to the true spirit of electrical progress, he foresees that if we would but spend that sum, ten years hence everybody would be using as much electricity as he required, as freely even as we now wastefully use water. We should do it without the need for everlastingly switching lights off upon economy intent! While we fully believe in organised publicity and have urged the strengthening of E.D.A., we rather think that one solution worth considering is to relieve E.D.A. from its publicity efforts and leave these to some other organisation, while E.D.A. itself devotes its energies to educational and commercial development works, including the training of canvassers and salesmen and some other things that are now left undone. But, let us repeat it again, even if to the point of weariness:—Every undertaking has new work that it must undertake for itself, whatever associations may do.

Electrical Benevolence

Now that our readers have paid their income tax and are planning how to deal with the surplus that will remain after they have added to the electrical equipment of their homes, we wish to urge upon their attention a reminder that we have received notice that the Electrical Trades Benevolent Festival is shortly to be held. It had to be postponed from November last owing to the political situation, but Mr. Allen West, the president, hopes that there will be a ready response to his appeal for donations in connection with the Festival which has been fixed for February 24th at the Savoy Hotel. It is a call from the less fortunate members of the electrical family for help in their time of need, and increased donations are asked for. Readers are requested also to take tickets from Captain Keeping (the Secretary, 9, Southampton Street, W.C.1) for the dinner-dance at one guinea each. We hope it will be generally recognised that the peculiar urgency of the moment calls for a generous response.

Uniform Street Lighting

AT a recent inquest in London a coroner referred to the dangerous condition of our streets due to their illumination being so often much below that required for modern traffic conditions. We all know how bad is the public lighting in some areas. It is no answer to point to other areas, perhaps adjoining, where the installation would meet any criticism; in view of an increase of over 160 per cent. in the amount of electricity sold for public lighting during the past eight years, it would be surprising if there were not many excellent examples. But such bright patches are themselves a source of danger, as the eyes of a driver of a fast vehicle travelling from the good to the bad area cannot adapt themselves quickly enough to the contrast. How long will it be before the lighting of the streets in each borough of a group is regarded as something more than a purely municipal matter? What is wanted is an independent lighting authority for the whole of such an area, which will be guided by the standards for street lighting practice that have been established to meet the requirements of any situation.

The Physical Society's Exhibition

THE twenty-second annual exhibition of electrical, optical and allied scientific apparatus organised by the Physical Society and the Optical Society of London was held this week. It is an eagerly awaited opportunity of learning what progress has been made in the fine art of precise measurement during the year, and is an impressive display of the designing ingenuity and skilled craftsmanship of the instrument maker. This year, while three or four well-known manufacturers were absent from the trade section, several new exhibitors were included, so that the total number (82) remained approximately as usual. The research section of the show, which was divided into exhibits illustrating recent investigation, and lecture and instructional experiments, appeared to be about the same as before, but in future years it is hoped still further to extend the scope and utility of this section. For the third year in succession good work was to be seen in the section for apprentices and learners. This year the prize list was augmented by a special award, in memory of the Finsbury Technical College, for outstanding merit. It was evident that manufacturers are not relaxing their efforts to maintain that soundness of design and excellence of workmanship in which the British instrument maker is pre-eminent.

Rural Distribution in Scotland

How a very sparsely populated area is served from the Grampian scheme

CATERING for a population of something like 418,000 spread over about 4,000 sq. miles, generally with only about 50 inhabitants per sq. mile, is rural electrification indeed; such is the problem of the Grampian Electricity Supply Co. The main 33-kV trunk lines referred to in our issue of December 18th are tapped at various places where, generally, the pressure is reduced to 11,000 V for local h.p. distribution. All the sub-stations at these points are of the outdoor type. In three cases, Kirriemuir, Gleneagles and Dunblane, the pressure is reduced to 440/250 V direct, and automatic switching is being installed.

A Unique Scheme

At the Gatehouse sub-station there is some particularly interesting equipment. Tappings from the north and south lines are connected, through fuses, to two 300-kVA Metropolitan-Vickers star-star connected 33/11-kV transformers. The h.p. supply from each transformer is passed through an equipment including an 11-kV oil switch, in a separate steel kiosk (one kiosk on each tapping). Each kiosk also houses a 2-kVA single-phase transformer (11 kV-230/100 V) in addition to automatic gear.

The two sets of automatic equipment are interconnected and so arranged that should the supply from either line fail the corresponding oil switch will trip and, after a time lag, the other switch will be closed by a 230-V motor. The key automatic equipment is a preferential biased relay which works in conjunction with special auxiliary contactor gear. By a suitable switch preference can be given to either line in the event of both becoming alive together. This automatic equipment was supplied by Messrs. Ferguson, Pailin, Ltd. It is similar to the B.T.-H. automatic selecting gear at Rannoch and Abernethy, but is believed to be the first outdoor equipment of its type in Great Britain.

A pole transformer

There are two other kiosks, one on each 11-kV line, which are again equipped with 11-kV oil switches and also the usual protection gear, operated by Met-Vick. induction relays. Additional mechanical gear (apart from the operating motor) is provided so that in the event of the switch operating under fault conditions it is reclosed after 30-sec. time lags any number of times up to six, and then remains permanently out.

The 33-kV and the 11-kV overhead gear is carried on a superstructure with the above-mentioned kiosks mounted underneath.

A typical l.p. line

From Gatehouse the 11-kV supplies are conveyed to a small outdoor switching station at the little Highland village of Kinnaird, where a small transformer serves a l.p. overhead network. The Kinnaird sub-station is a three-member (wood-pole) structure of a very rigid type, incorporating 11-kV air-break switches. One 11-kV circuit is continued to Pitlochry, entering the village by underground cable which feeds a brick sub-station. The sub-station building also incorporates a linesman's store.

It is not proposed to detail all the distribution schemes in the area, but the small section outlined will serve to depict the general practice. Every locality, of course, has its special problems. Generally the 11-kV lines are single-pole structures with the " wish-bone " method of conductor arrangement and Bullers pin-type insulators. The lines are usually protected by oil switches, either of the outdoor type or others in steel kiosks.

Pole transformers are mostly used for l.p. supplies to the smaller villages, while in the larger ones brick " subs " or kiosks are installed.

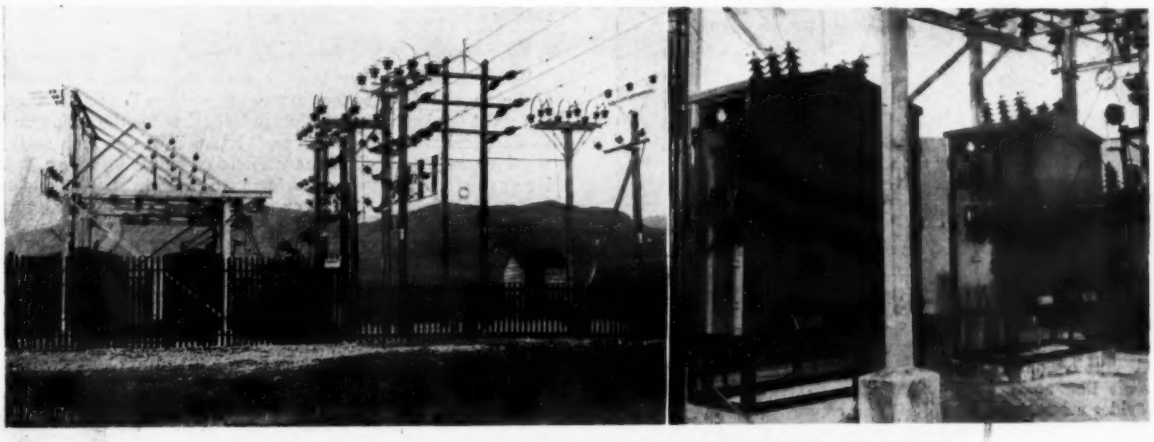
Operation Notes

The 33-kV lines can be sectionalised by air-break switches, but care has to be taken that too long a line is not broken when alive, as it is found that it is difficult to break line charging current, *i.e.*, leading power-factor current, and the limit to the length of line which can be broken is about fifteen miles. A much greater lagging power-factor current, such as transformer magnetising current, can be broken on such switches.

All the air-break switches are operated at the ground level, and the usual bottom lever top bell-crank construction prevails. Most of the air-break switches were supplied by Electric Transmission, Ltd., and Electric Control, Ltd.

It is considered that there is room for improvement in the operating gear for such exposed areas, and some criticisms were heard of the lubricating arrangements for the operating gear. Could not grease be applied at a central point for lubricating the whole of the bearings? It would not be very expensive to provide small tubing for this purpose. Generally the outdoor sub-stations have given great satisfaction, and there have been very few faults indeed in connection with them.

Most operating engineers will envy the Grampian people in one respect, at least. The purity of the air in the High-



General view of Gatehouse sub-station and " close-up " of automatic gear in kiosks

D

lands is evidenced at times, when overhead equipment—insulators, air switches, and so on—is completely embedded in snow and there are no signs of arcing or even static discharge. Various types of transformers are used throughout the system, including those supplied by Messrs. Crompton Parkinson, Ltd., Bruce Peebles, Ltd., the Metropolitan-Vickers Electrical Co., Ltd., the British Electric Transformer Co., Ltd., the Hackbridge Electric Construction Co., Ltd., and the A.S.E.A. Co.

At many of the 33-kV transformer points protection is afforded by fuses—B.T.-H. expulsion type, "Aeroflex" equipment by Messrs. Parmiter, Hope & Sugden, Ltd., and Met.-Vick. tetrachloride fuses.

Low-voltage Work

In general the 440/250-V layouts comprise a greater part of overhead line and a small amount of underground cable. For overhead work Nos. 1, 3 and 5 solid h.d. copper are used, and generally there are five wires in a vertical formation—three phases, one street-lighting switch wire and a neutral. The use of D irons and porcelain shackle insulators with the vertical arrangement gives a very neat and unobtrusive appearance to the lines. The scheme also lends to very simple guarding at P.O. crossings, above or below.

L.p. terminal pole showing underground to overhead connection

Services at the pole fronts are secured to the line insulators, and the connections are made by Henley line taps. In the cases of pole-back services additional D irons are fixed by the same bolts as hold the line irons. No. 10 s.w.g. (minimum) P.B.J. wire is largely used for the services, and in each an aerial fuse is fixed in the phase wire about a foot or 18 in. from the pole—within the linesman's reach from the pole. For services of over 50 or 60 yards length an intermediate pole is generally used.

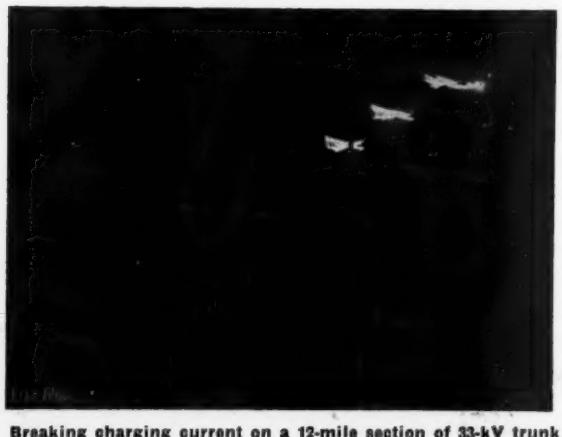
The supply company attaches considerable importance to getting street lighting established in the villages. This has great publicity value, and the establishment of the distribution system, particularly overhead, accelerates the obtaining of new business in that it often eliminates the necessity of fixing up guarantees for individual supplies.

Street Lighting

The use of overhead wires for street lighting is encouraged by the company by allowing the local authorities to use the line poles for their lighting fittings free; the system is erected by the undertaking for general supply and is not regarded as merely a street-lighting scheme.

While in the smaller villages endeavours are made to obtain sufficient guarantees to justify the capital expenditure upon the mains, &c., the practice is not strictly adhered to where there are prospects of obtaining a justifiable return in reasonable time.

Owing to the large number of isolated shooting lodges and mansions in the area, the question of individual pole-transformer supplies receives very close attention, and there are many interesting examples of such work.



Breaking charging current on a 12-mile section of 33-kV trunk line

A tapping on one of the main 33-kV circuits on the four-circuit line at Kinloch Rannoch, with reduction to 11 kV, provides a temporary supply to the construction works at that point; two pole transformers for a couple of shooting lodges are also tapped off this line.

The resulting 11-kV line will eventually link up with that from the tapping on the other 33-kV circuit at Tummel Bridge, forming a ring main with a section switch in the 11,000-V line. The line will pass several other shooting lodges, and it will also serve for the control of the weir at Kinloch Rannoch from the Tummel Bridge power house (see ELECTRICAL REVIEW, December 4th, 1931, p. 835).

Continuity of Supply

In designing the general lay-out of the system as a whole special care has been given to the insulators to ensure that they have sufficiently liberal electrical characteristics. Sound and substantial mechanical construction of the whole of the lines is an outstanding feature.

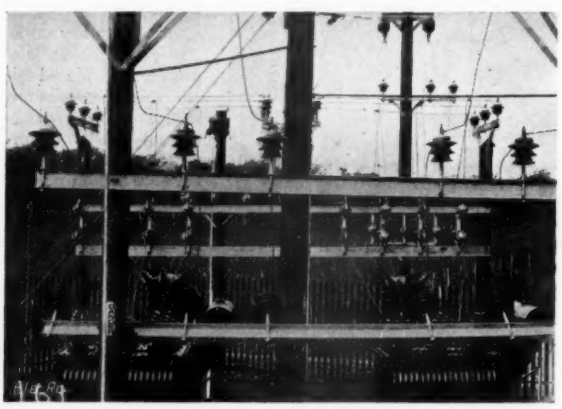
On all the lines protection is afforded by continuous overhead earth wire. Particular attention is also paid to the type of protective gear used and testing and inspection are carried out very methodically.

The culmination of all these features combined is a high degree of continuity of supply throughout the whole system, even in the most remote parts.

Commercial Development

The Grampian area is divided up into four sections, each of which is under the control of a district manager. This was found to be necessary as the 4,000 sq. miles was far too great to permit of close contact with every part from a central office. The district manager comes to be regarded by the inhabitants as the local counsellor on electrical matters, and he is therefore able to keep in close touch with local developments and requirements.

It is highly creditable that over 2,000 consumers have already been connected to the system, for it was no ordinary task. The load is chiefly domestic in character, but there is a steady increase of industrial consumers—corn mills, quarries and farms. The provision of supplies to the various villages has resulted in local tradesmen securing the services of skilled electricians from the larger towns and setting up as electrical contractors.



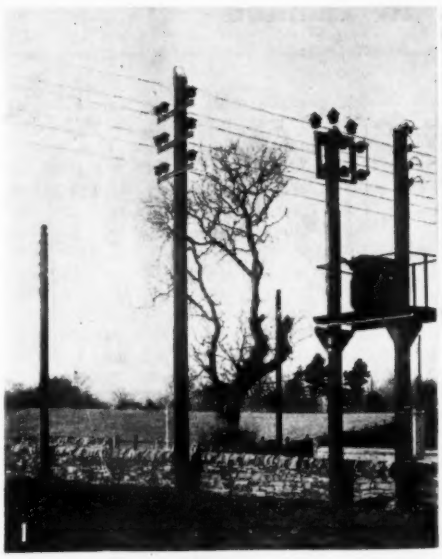
Jumper connections, switches, &c., at a 33/11-kV sub-station

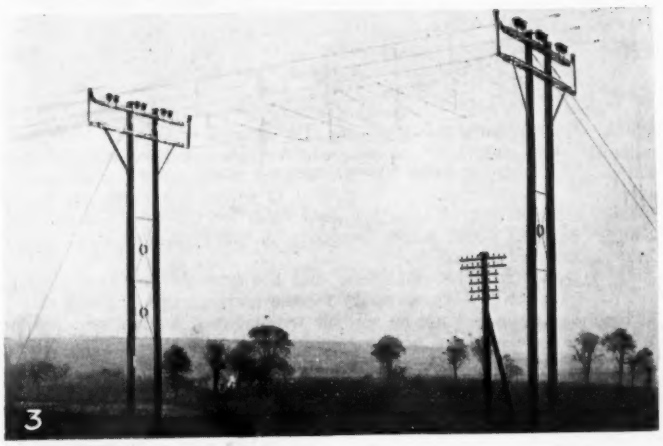
The general tariffs in vogue are: Lighting, 8d. per kWh; heating and small power, 4d. to 3d. per kWh, according to consumption, all with a minimum charge of 13s. 4d. per quarter. In addition there is an alternative combined domestic rate of 6s. 3d. per quarter per habitable room, plus 1½d. per kWh. Considering the nature of the area supplied it will be readily agreed that the tariffs are very reasonable.

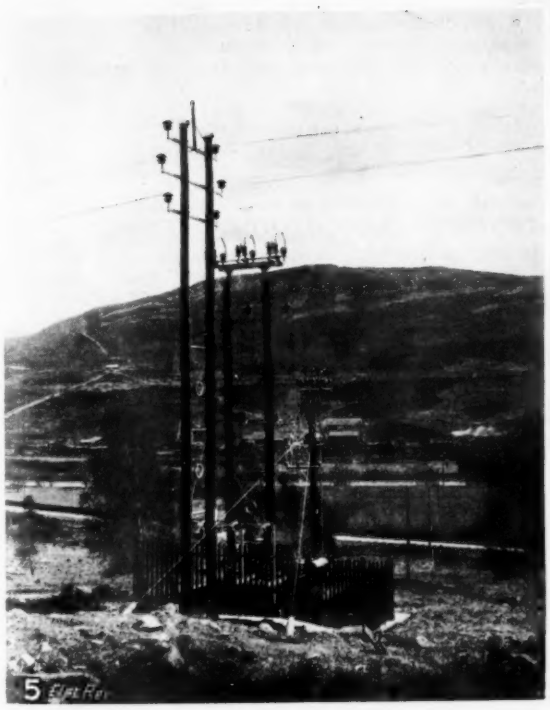
The Force of Example

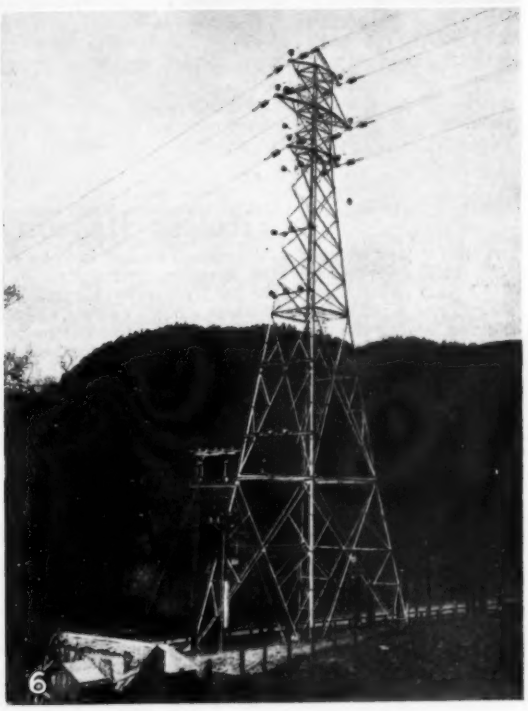
By means of circulars the company stresses the advantages of the use of electricity for purposes other than lighting. There is a great tendency in the Highland districts for the canny Scot to wait and see his fellow man "bitten," but as soon as the word passes round that the electricity bill is less than that for gas he is not slow to ask for an electricity supply, and to inform his friends. It is expected that the availability of cheap power will augment the efforts of the Scottish National Development Council to attract industry to the area and to arrest the southward migration.

With this third article we complete our description of the Grampian supply scheme and desire to express our indebtedness to Messrs. Balfour, Beatty & Co., Ltd., the Grampian Electricity Supply Co., and to various members of the staffs of both concerns for their help in the collection of information in all parts of the extensive area in limited time. Incidentally we should mention the fact that we have seldom seen such enthusiasm for "the job" as that displayed by every staff member we met in the course of our visit.









Electricity Supply in the Grampians

1. Two 440/250-V supplies from an 11-kV pole sub-station; 2. A village sub-station with outdoor transformer; 3. Guard between a 33-kV line and a G.P.O. trunk; 4. Distribution from a terminal pole; 5. Tummel sub-station (33/11 kV); tapping from four-circuit trunk line; 6. Trunk-line tapping for l.p. supply—note jumpers down towers.

Wiring Symbols. By H. R. Taunton

The need for uniformity

TOT homines, tot sententiæ; which means, roughly, that a dot conveys volumes to one man and nonsense to another. To the contractor who gets by every other post a plan dotted all over with symbols which are meaningless until their inventor supplies the code, dots mean exasperation. misunderstandings, waste of time and sometimes of money. He usually retaliates by marking up his own plan with more dots, as arbitrary, illegible, and unrecognisable as anybody else's.

It is amazing that so simple a point has been so long neglected in this age of "rationalisation." It is as if every architect's and contractor's office spoke a different brand of Hottentot and could only communicate with each other with the aid of a dictionary. Surely it is of sufficient importance to make it worth the trouble to the E.C.A. to prepare a uniform code and have it agreed and adopted by the architects and consultants.

Simplicity and Clarity Needed

I have no ambition in what follows to add yet another set of wiring symbols to the existing chaos, but rather to examine generally what would be required of any standard code to secure its acceptance as satisfactory by the several parties interested. If some of the correspondents of the ELECTRICAL REVIEW are sufficiently stimulated by the subject to air their own views on it, we may perhaps—and perhaps not—find a measure of agreement on certain points: enough, let us hope, to encourage our leaders to tackle the question, and to give them some basis from which to start.

The first need of any standard code of wiring symbols is simplicity. The number of symbols must be strictly limited to about a dozen. That should cover every common contingency. It must be remembered in this connection that, except in the simplest cases—and then the point will hardly arise—marked plans are read in conjunction with a detailed schedule, which will afford all necessary information as to minor differences.

The main object of marking up a plan is to indicate no more than the *position* of various items more fully described in the schedule. This, by the way, is greatly facilitated if symbols are numbered to correspond with the scheduled particulars.

The Scope of a Code

It would be absurd and hopeless to attempt to cover such uncommon requirements as, say, a time-switch, or to differentiate between the seven-and-seventy varieties of wall-sockets.

A convenient symbol for a 5-amp. switch-socket is a small triangle △, its base against the wall. If we reverse it with its apex against the wall to represent a socket on open circuit ▽, or make it solid to represent a 15-A switch socket ▲, we should with these three symbols cover every practical requirement. To ask a busy engineer or draughtsman to refer to a voluminous key for what he should be able to carry in his memory is simply to court disuse.

For the same reason, symbols must be as logical and as elementary as possible, so that they are in themselves mnemonics. Take, for example, the one symbol that is most generally accepted, the small circle ○ for a ceiling point (or ○— for a bracket point). Or, equally simple, though not so universal, the cross × for a switch, or star ✱ for a two-way switch. In order, too, that they shall be clear on sometimes poor prints, they should be open in character, free from niggling detail, and each typically different from all the rest.

To try to symbolise, for example, a fuseboard by a small illustration of it to show the number of poles and ways is only confusing and quite unnecessary. We only want to know its position, which might be indicated by a large solid rectangle ▬ and we can get the rest from the specification. Obviously, too, no symbol should be liable to confusion with lettering, figuring, dimension or other common marking on a plan.

Colours Inadvisable

We must have black and white symbols, *e.g.*, a special lighting point on a police or secondary service could be indicated by a solid circle ●, or junction boxes in ceiling or floor by open or solid squares □ ■. These are quite clear, and independent of colour. A plan marked up in three or four colours is easy to read and looks very pretty, but as often as not original tracings have to be marked up, and the significance of any colour on them is lost when a print is taken from them.

The symbols should be essentially freehand characters, while easily amenable to square and compass when special neatness and uniformity are required. A single stencil, in which all the symbols could be cut, would meet the needs of the architect's draughtsman. As to size, 3/16 in. as the diameter of the point symbol affords a good basis for the usual eighth-scale plan. Much larger would be clumsy; smaller might sometimes be illegible.

It is to be understood that the symbols we are discussing are only those necessary for the marking up of wiring plans. They might not be suitable without modification for marking up elevations, or for diagrams of connections. The latter, moreover, are to some extent provided for in B.E.S.A. Pamphlet No. 108. It hardly matters, in any case, as diagrams, in the first place, do not have the same circulation between architects and contractors as do wiring plans, and, in the second, they are usually more or less self-explanatory, with a sufficiency of letterpress.

I see that, in spite of my earlier disclaimer, I have contrived to put forward a fairly comprehensive list of symbols. I may as well add another couple: a small rectangle ▭ for a bell-push, and a large crossed square ⊠ for a main-switch. I have found these thirteen symbols to suffice for all ordinary needs during many years. They have, I think, most of the virtues suggested as necessary; but they have the one fault which everybody else's pet symbols have: they need a key for interpretation by any but their originator.

Wireless Beacon for Croydon Aerodrome

A NEW type of wireless directional beacon is to be erected at the London Air Port, Croydon, by the Marconi Company to the order of the Air Ministry. This visual course indicator will act as an automatic guide to aircraft approaching and leaving the aerodrome on the Continental route.

The special lightweight receiver dial has a black background on which appear two vertical white lines. If the aircraft deviates to either side of the correct course the white line on that side of the dial increases in length and the white line on the other side decreases. No tuning or adjustments are required, as the beacon transmitter and the automatic receiver operate on a fixed wavelength.

The course indicator transmitting station emits, from an aerial system consisting of two loops arranged at an angle, a "beam" on each side of the air route, so that aircraft travelling on the correct route receive the signals of the two beams at equal strength. On the dial in the cockpit the two white lines, which are in fact the ends of a pair of rapidly vibrating reeds, are equal in length (that is, the reeds are both vibrating at the same amplitude).

If, however, the aircraft deviates from the correct route one beam is received at greater strength and, as the two beams are modulated at different frequencies, the reed which is tuned to the frequency of the stronger signal vibrates more strongly. The visual line depicted by the end of this reed on the dial thus becomes longer, while the vibration of the other reed weakens and the corresponding visual line shortens. In this way the pilot is immediately warned of his deviation and he has only to "steer towards the shorter line" until the reeds are again balanced in order to regain his course.

At Croydon the special aerial system of the course indicator will consist of two Bellini-Tosi triangular "loops" supported by a lattice steel tower 100 ft. in height. The base of each loop will be approximately 300 ft. in length, and the outer extremities will be carried on steel jury masts some 20 ft. from the ground and kept taut by a system of counterweights.

The transmitter will comprise a drive circuit and two intermediate amplifier stages, each followed by a power amplifier stage. The drive will consist of a high-frequency oscillation generating circuit employing one valve and tuned to 306 kilocycles, the oscillations of which will be applied to the grids of each intermediate amplifier. These will each employ a single valve, the anode being fed by high-voltage direct current upon which will be superimposed an alternating potential (generated by separate alternators for each intermediate amplifier) at frequencies of 65 and 86.7 cycles, respectively. The outputs of the amplifiers, modulated to these frequencies, will then be passed to the power amplifiers, each of which will have an input of 1 kW to the anodes and will operate into one of the goniometer stators.

Receiving equipment for the aircraft will employ a vertical rod aerial approximately 10 ft. in length, of stream-lined cross section, mounted on the fuselage or in any other convenient situation. The components of the receiver will be mounted on a screened metal chassis contained in a metal case with shock-absorber suspension, the receiver circuits comprising three tuned high-frequency amplifier circuits with ganged controls, and a detector, followed by a low-frequency magnification circuit.

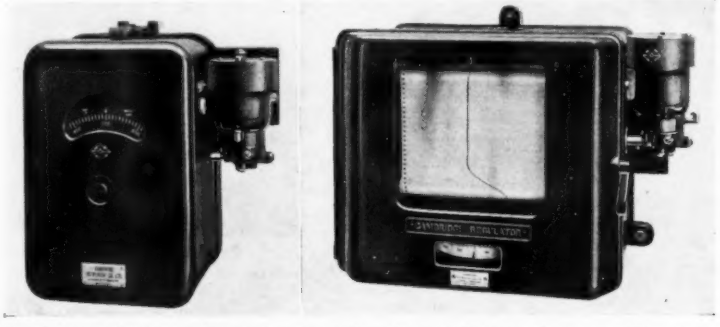
Electrical Instrument Progress. By H. C. Jolley, A.M.I.E.E., F.Inst.P.

Some new apparatus at this week's exhibition

THE annual exhibition of the Physical and Optical Societies is always looked forward to with anticipation by all who are interested in physical and electrical apparatus, since it is generally regarded as an opportunity of becoming familiar with the latest developments in this class of apparatus. But as well as this, the Exhibition induces manufacturers to complete new devices for inclusion in their displays sooner than they otherwise might have been.

This year's Exhibition was quite up to the high standard established in previous years, and definitely showed that British instrument makers are still maintaining the excellence of product which has been so markedly evident in the exhibits of past years.

In the twelve months which have elapsed since the last Exhibition a surprising number of new ideas have been developed. Many of these are, however, rather in the nature of improvements, but this is to be expected when we remember how thoroughly the field of instrument design has been thrashed over in past years.



Two " Cambridge " instruments: An automatic regulator and a recording controller for temperature, pressure, &c.

New Materials

A considerable impetus has been given to instrument design by the introduction of new insulating and magnetic materials, and the effective use of their special properties has resulted in greater perfection in performance and simplicity of construction. Because of their importance, both at present and in the future, one welcomed the display of Bakelite, Ltd., and Ebonestos Insulators, Ltd., who both showed a wide range of their products.

The Telegraph Construction & Maintenance Co., Ltd., also had a very interesting exhibit illustrating the remarkable magnetic characteristics of " Radio-Metal " and " Mumetal." Salford Electrical Instruments, Ltd., exhibited " Gecalloy," a material which is a highly compressed and insulated magnetic powder, produced in a high degree of purity and uniformity by special processes. These, together with the exhibit of the Thermal Syndicate, Ltd., of fused silica products, constituted the only exhibits of materials, and one would have liked to see this very important and interesting section of the Exhibition considerably extended.

Automatic Controllers

The Cambridge Instrument Co., Ltd., again had a comprehensive show of its wide range of products. Among these were examples of a new series of automatic controllers based on similar principles to those shown in previous years, but which have now been modified so as to be capable of making and breaking currents sufficiently large to operate switches or motor-driven valves without the use of an intermediate relay.

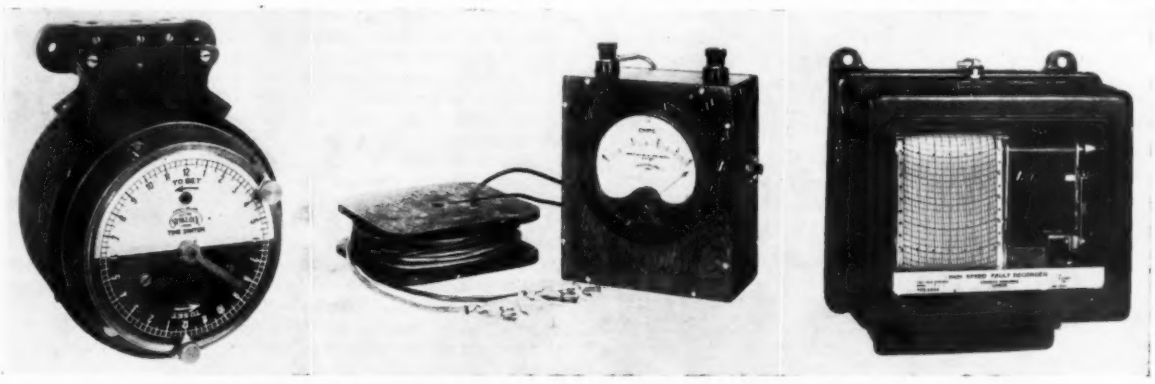
A particularly interesting recording potentiometer controller was shown, in which a continuously running motor mounted beside the instrument keeps the chart-driving clock fully wound and operates the recording mechanism. Should the power fail and the motor stop, the chart continues in motion for several hours, so that the record is maintained over the period of breakdown.

Another outstanding exhibit was the photo-electric relay system of galvanometer measurements employed by Prof. A. V. Hill, F.R.S. A photo-electric cell, consisting of a copper disc, is oxidised on one face, and this face is then spluttered all over with gold to make it laterally conducting. When light falls on the gold face and a galvanometer is connected between gold and copper faces a current will pass whose magnitude is directly proportional to the total amount of light.

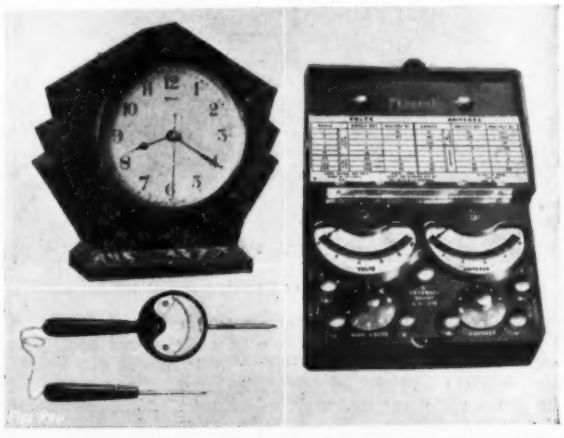
In employing the device as a galvanometer relay the cell is made differential by removing a narrow strip of the gold from the oxide along a diameter of the disc, and a secondary galvanometer is connected between the two semi discs of gold which are left. The primary galvanometer mirror focuses the image of a brightly illuminated slit symmetrically on the cell so that the two halves receive equal amounts of light when this galvanometer is at zero, and therefore the secondary galvanometer is also undeflected. But when the primary galvanometer is deflected, the equality of illumination on the two halves of the cell is disturbed, and the secondary galvanometer is deflected by the comparatively large photo-electric current produced by the effect upon the cell.

A radiation balance, devised by the late Prof. H. L. Callendar, was also shown. In this the heat absorption due to the Peltier effect of a thermo junction is made to compensate the radiation, and, by making the arrangement differential, the heating effects of the current employed through the junctions are completely eliminated.

The Thornton ionic-wind voltmeter for measuring high voltages was another exhibit. This instrument was described recently in the *Journal* of the Institution of Electrical Engi-



A " Synclock " time switch, pocket testing set and high-speed fault indicator (Everett, Edgcumbe)

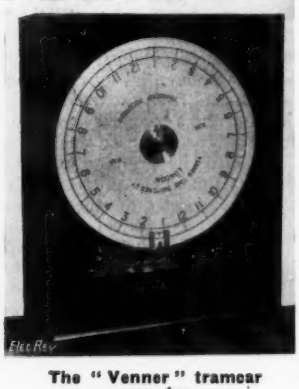


Ferranti mains clock, cell tester and multi-range radio testing set

neers and therefore does not need detailed description here. Another exhibit was a new pivoted type of Grassot flux meter, which if anything has a greater sensitivity than the original suspended type.

Crompton and Ferranti Exhibits

Messrs. Crompton Parkinson, Ltd., made a special feature of a handy little instrument called the "Tong Test." This is really a development of their well-known a.c. test instrument. The laminated iron circuit through which the conductor is threaded is divided and hinged so that by means of a trigger it can be opened and closed like a pair of tongs. Into a specially shaped gap in this iron circuit the moving iron movement can be introduced. This movement, together with the scale and pointer, is contained in a moulded Bakelite housing which can be slipped into position and brought to register in a few seconds. The range is altered by using alternative movements and the whole arrangement is very light and simply manipulated and may be used on either a.c. or d.c. circuits.



The "Venner" tramcar recorder

Messrs. Ferranti, Ltd., showed a complete range of 2½-in. instruments which they have developed to a high degree of excellence. Moving coil, moving iron, rectifier, thermal, and electrostatic types were included. A unique feature of the moving iron instruments is that not only have they a very excellent scale shape, but a total angle of 110 deg. has also been obtained. The construction of these instruments has some excellent features—the damping chamber, support for the back jewel, and fixed iron being all in a single Bakelite moulding—and this type of construction has now also been adopted in the larger types of instrument.

Since the last exhibition two- and three-range voltmeters of the 2½-in. type have been developed and the maximum self-contained range has been extended to 400 V with a resistance of 210 ohms per volt. Messrs. Ferranti claim to be among the first to employ dry rectifier operated instruments and they exhibited three of the original 1928 instruments which have not varied more than one per cent. up to the present time.

Another new feature exhibited was an electric mains clock. The synchronous motor employed is an excellent piece of construction, the rotor spindle being carried in spherically seated self-aligning bearings. Generally they employ a hand started motor running at a speed of 166⅔ r.p.m., but a self-starting model was also shown running at 120 r.p.m.; the power consumption is 0.75 W.

An electric oven by Griffiths & Tatlock

A further exhibit was a precision current transformer with "Mumetal" core. The N.P.L. certificate showed that there was no ratio error on non-inductive load from 1¼ full load to one-twentieth of full load for 5 VA and 15 VA output, and the phase angle was uniformly +1 minute. A unique feature of this transformer is the secondary terminal arrangement, which is so designed that it is impossible to remove a secondary lead from either terminal and leave the secondary open circuited.

Messrs. Evershed & Vignoles, Ltd., showed the latest addition to the "Megger" group of instruments for which they are renowned. This instrument—the "Meg" earth tester—is designed to give direct readings in ohms and these readings are unaffected by vagabond currents or soil electrolysis; the lower range of the scale is very open and readings within fractions of an ohm can therefore be obtained.

Electric Clocks

Messrs. Everett, Edgcumbe, who have been pioneers in the development of synchronous motor-driven clocks, displayed some of the most recent applications of the Warren motor drive to time switches where the advantages of its exact time-keeping qualities on controlled-frequency circuits and the fact that it does not require regulating or winding are specially valuable. Instantaneous stopping and starting up in either direction has been adapted to the purposes of remote control and indication.

Ediswan ray tubes

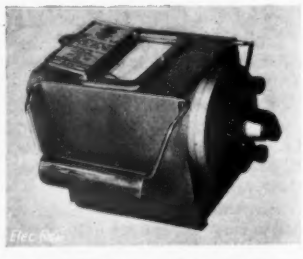
Another interesting instrument shown at this stand was a fault recorder which under normal conditions behaves as an ordinary recorder of pressure or current with a chart speed of 1 in. per hour, but on the occurrence of a fault the chart speed is automatically and instantly increased to ½ in. per second and this speed is maintained until the fault is cleared, after which the chart runs on for a period until the timing is again correct, when it resumes its normal low speed. A special short-period inking mechanism ensures that the rapid changes in voltage during the fault period are accurately followed.

Harmonic Detector Equipment

A harmonic detector which was shown by the company consists of a voltmeter provided with three scales. By means of a three-point switch the movement is connected either to a non-inductive resistance when it reads the fundamental, or to one or other of two resonance circuits when it reads the percentage of the third or fifth harmonic in terms of the fundamental on the appropriate scale.

Messrs. Everett, Edgcumbe, also showed their auto-repeater system. In this a direct current proportional to the quantity to be transmitted is sent to the distant station to operate the recorder or indicator. An important feature of the system, however, is that although d.c. is transmitted its actual magnitude is controlled by an alternating current through an induction regulator and in this way rubbing contacts are eliminated.

Messrs. Muirhead displayed several new developments, among which was a 1,000-cycle valve maintained fork. The Dye elinvar fork is mounted in such a way as to ensure minimum energy loss through the support and is suspended in a brass cylinder maintained at constant pressure. This cylinder is surrounded by a toluene regulator and is placed in an oven whose temperature can be maintained constant to within a hundredth of a degree. The fork is used in conjunction with a 1,000-cycle phonic motor, and thus forms a time standard of great precision with the added advantage that sub-division to 0.001 of a second can be obtained with precision.



The "Meg" earth tester

Other ingenious applications of the phonic motor were shown. The constant speed set, controlled by the 1,000 cycle phonic clock, is capable of withstanding considerable fluctuations of load without losing synchronism. It is, however, pointed out that any other form of clock can be used for control purposes. The firm also showed a robust and simple type of bifilar oscillograph in which the vibrators reflect light to an octagonal mirror driven by a phonic motor which gives in turn a stationary image on a viewing screen.

Indicators and Recorders

Messrs. Nalder Bros. & Thompson, Ltd., had a representative display of their well-known indicating instruments, among which was their new induction pattern deflectional type of

frequency meter in which voltage and temperature errors are reduced to a negligible amount. A new series of recording instruments was also represented, as well as several new designs of protective relays.

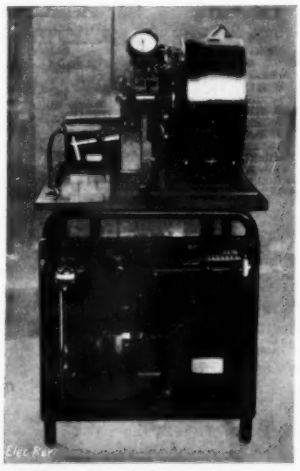
Messrs. H. Tinsley & Co. made a good display of their precision apparatus. An entirely new feature was an ammeter which operates on a novel principle and is due to Dr. Barlow. The filament of a diode valve is heated by a direct current and the conditions are such that the valve is saturated. This valve forms one of the arms of a bridge. When an alternating current is superposed, through an electrolytic condenser, on the filament current the emission from the filament increases greatly and the increase is measured by a suitable instrument. It is claimed that the arrangement is accurate over a range of from 25 to 6×10^6 cycles.

Quartz-controlled Wave-meters

Messrs. H. W. Sullivan, Ltd., also exhibited a 1,000-cycle elinvar fork, valve maintained and temperature controlled. There were also several new sub-standard wavemeters, including an example of the Lucas Sullivan quartz-controlled multivibrator wavemeter with a range of from 100 to 6,000 metres. In this a harmonic-rich generator with a fundamental frequency of 50 kc. has its frequency controlled by a separate valve oscillator, which in turn is controlled by a Lucas Sullivan evacuated-quartz crystal standard. From this generator harmonics from 50 to 3,000 kc. are obtained directly, while another generator of exactly 1,000 cycles, also controlled by the quartz standard, produces a series of beat effects which facilitate exact interpolation between these harmonic frequencies.

This controlled low-frequency multivibrator is also used to drive through an amplifier a phonic motor synchro-clock and provides for the observation of the exact frequency of the wavemeter to one part in a million.

Messrs. Sullivan also presented a new radio-frequency capacity test set for a range of 0 to 1,000 mmF. A modification of this apparatus for accurate capacity matching was also shown.



Duddell high-frequency oscillograph (Cambridge)

The Record Electrical Co., Ltd., had many examples of its "Circscale" instruments and insulation testing apparatus. The company has also developed its electrical tachometer to a high state of perfection and the latest model of generator embodies some excellent design.

The maximum current indicator consists of an ammeter fitted with an auxiliary indicating finger which is moved over the scale by the pointer on the movement so that it is left in the position of maximum deflection. By a very ingenious oil-immersed device attached to its spindle any drift in this indicating finger is eliminated and instantaneous surges are damped out, as the current must persist for 30 seconds in order to allow the device to assume the new stable position.

Deflectional Frequency Indicators

Messrs. Elliott Bros. (London), Ltd., exhibited several interesting instruments, including deflectional frequency indicators constructed under the patent of Mr. Shotter. These are of the induction resonant circuit type and a long open scale is secured in the low-frequency pattern being, for instance, from 48 to 52 cycles per sec., while in the high-frequency pattern the range is from 900 to 1,100 cycles per sec., it is claimed that these instruments are practically free from wave-form and temperature errors.

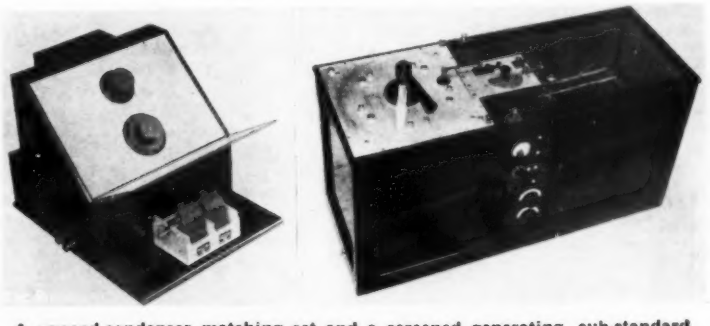
The Foster Instrument Co. showed some of its indicators and recorders adapted to meet the general tendency to adopt flush-mounted instruments in switchboard practice, electrically driven clocks being employed. We noticed here an excellent model of the "Resilia" spring mounting which is used for the moving coils of Foster instruments.

In general it should be remarked that the exhibitors by the free use of such models of special features and displays of dismembered instruments so that the internal construction could be examined by the visitor, contributed very greatly to the general interest and educational value of the Exhibition, and at the same time displayed interior work of which the makers may be justly proud.

Miscellaneous Exhibits

In addition to the firms of which mention has been made there were many others who displayed interesting apparatus.

The Igranic Electric Co., Ltd., showed equipment for the automatic operation and regulation of electric motors actuated by alterations in pressure, temperature, &c. Among the Edison Swan Electric Co.'s exhibits were a set of ray tubes which we illustrate; the company also showed a cathode-ray oscillograph, radio valves and sound-reproducing apparatus.



A ganged-condenser matching set and a screened generating sub-standard wave-meter by H. W. Sullivan

Several patterns of time switch and ancillary apparatus appeared on the stand of Venner Time Switches, Ltd. We illustrate a recorder for automatically noting the number of trams passing a certain point.

Wild-Barfield Electric Furnaces, Ltd., showed its patent forced-draught furnace for heat treatments up to 700 deg. C. Laboratory standard and portable testing instruments were exhibited by the Weston Electrical Instrument Co., Ltd., the range including a number of models for radio work. The Zenith Electric Co., Ltd., had a display of small transformers for h.p. testing, &c., as well as a number of examples of its resistances and meter-testing equipment. The British Electric

A "Synclock" display

Resistance Co., Ltd., was another concern which exhibited resistances, including examples of the adjustable box, commutator, and vitreous-enamelled types.

A new demonstration oscillograph was shown by Messrs. Sprenger and Co., and Mr. Ernest Turner's exhibit covered electric clocks and measuring instruments of various patterns. Several kinds of its dry rectifiers were presented by the Westinghouse Brake and Saxby Signal Co., Ltd. Radio valves, &c., were shown by the M.O. Valve Co., Ltd., and the Marconiphone Co., Ltd., and the Mullard Wireless Service Co., Ltd.

Power-load Canvassing. By G. T. Allcock, B.Sc., A.M.Inst.C.E.,

The work of the Sales Engineer of a supply undertaking

A SYSTEMATIC canvass of the country, such as has been suggested in the ELECTRICAL REVIEW, is a practical and promising method of providing that steady increase of load on which the success of the grid scheme depends. House-to-house canvassing has long been used by supply undertakings as a means of attracting domestic load, but up to the present few have attempted to increase their industrial load on the same lines.

The systematic canvass of an industrial area involves much work, and demands knowledge, wide engineering experience and tact on the part of the canvasser. It should be undertaken only after very careful consideration as to the results to be aimed at, and the methods to be adopted. There is a danger on the one hand of losing sight of possible new business through carelessness in keeping records of the information collected, and on the other hand of spending more time on digesting information than is justified by the amount of new business obtained. The essential object of the canvass is to get business, and not statistics, though the latter often prove useful in the preparation of schemes and estimates.

[Ingham, Bowdon

Mr. G. T. Allcock, the author of this article, is assistant power sales engineer in the Manchester Corporation Electricity Department

Essential Preliminary Knowledge

The sizes of motors to recommend, the maximum demand expressed as a percentage of a connected load, and the annual load factor are questions that must be answered before a scheme for electrification can be put forward. Statistics gathered during a power canvass form a guide, but any attempt to collect such information on a large scale and to classify it for general reference is foredoomed to failure.

During a recent canvass of eighty electrically driven works engaged in wood-working and cabinet-making, it was found that demand factors varied from 26 to 68 per cent., and load factors from 11.4 to 20.6 per cent. Many reasons were found for these wide differences, such as the seasonal nature of the demand for certain goods, the practice in some works to cut wood from logs, and in others to buy planks cut at a sawmill.

Consistent results cannot be obtained unless industries are sub-divided for classification purposes in such detail as to be impracticable. It is nevertheless helpful when faced with the electrification of a works to make a careful study of the load characteristics of two or three already electrified works which manufacture the same class of goods.

Method of Canvass

The canvasser's first duty when calling on a firm is to make friends with the man who will have the final responsibility of saying "yes" or "no" to any proposals. He should find some excuse for walking round the works and should obtain the information he wants with as little show of cross-examination as possible. If he sees opportunities for an increased use of electricity, he should talk of them in general terms.

Only in very exceptional cases does it pay to discuss definite plans and estimates in the first interview. There are so many pitfalls and unforeseen factors which may arise, owing to electricity tariffs, conditions of use of the apparatus, and so forth, that it is a wise man who can state immediately whether, say, electric furnaces would be economic for some particular application.

A consumer will not object to a canvasser's reserving judgment on some point, but he will distrust a man who assures him that electricity will cut his costs of production, and later rings up and admits that he has allowed enthusiasm to outrun discretion.

The information to be noted down varies according to circumstances, but it should include:—

(1) The name of the man interviewed.
(2) The number and h.p. of any motors already installed.
(3) The number and total h.p. of any engines in use.
(4) The condition of the lighting installation.
(5) Any apparatus, such as electric furnaces or welders, the use of which could be recommended.
(6) Any complaints made as to the service received from the supply undertaking in the past.

If the canvasser scents the possibility of new connections, he should obtain permission to submit his proposals in the form of a report. This report should be carefully drawn up and should be absolutely sound from an engineering point of view.

Any new business that does not later prove economic from the user's point of view is a standing reproach to the sales staff, and will cause more damage to the prestige of the undertaking than is compensated for by the increase of load. It may even be necessary to dissuade enthusiastic consumers from adopting electricity for purposes which would be better met by some other agent.

Report on a Proposed Scheme

The report should give clearly and simply those aspects of the proposals which would enable the manager or board of directors to judge the merits of the scheme. For instance, a proposal to replace an old steam engine by electric motors could usefully be drawn up on the following lines:—

(*a*) A short description of the present plant.
(*b*) An estimate of the present annual running costs of the engine and boiler, including coal, labour, oil and stores, insurance, maintenance, and repair bills, averaged over the last three years. It may not be possible to obtain all this information, but the items should be given even if the amounts have to be left blank. The works manager can fill in the blanks before submitting the report to the directors.
(*c*) A description of the proposed electrical equipment, stating what size of motor should be installed to drive each group of machines.
(*d*) An estimate of the overall cost of the electrification, including any mill-wrighting that may be necessary. The estimate should be a generous one and should allow for a thoroughly sound job. It is the contractors' privilege to cut each others' throats when tendering; the power salesman should not perform this operation for them in advance.
(*e*) A statement of the electricity tariff, and an estimate of annual running costs when performing a service equivalent to that of the old engine.
(*f*) A clear statement of the advantages of electrification as applied to that particular works in labour saving, economy of floor space, greater reliability, and so on.

The report should not be a specification for the work, still less should it resemble a contractor's tender for the installation. It is written for the information of the administrative heads of the firm, who will look for replies to three main questions.

(1) What advantages will it have in our works?
(2) What will it cost?
(3) What are our present arrangements costing?

Details of the proposed drives may interest the works manager, but they do not influence the directors, and the essential condition for obtaining new business is to persuade the directors of the firm to lay out the necessary capital by proving that it will be to their advantage.

Thorough Exploration

Industries in which the power requirements for each works are likely to be large should be dealt with individually, and a visit should be paid to every firm in that trade in the area, but small miscellaneous trades are best dealt with by a district canvass.

In order to ensure that the ground shall be completely covered, it is necessary to work to a large scale map (one inch=220 ft. is a convenient scale) on which may be marked the name of each firm, the total load connected, and also, in some distinctive colouring, the new load which can reasonably be expected within two or three years. For convenience, this map may be cut into small sections, the best size being the economic distribution area of an a.c. network sub-station. (A map section is illustrated.)

It is most effective to take one area at a time, thoroughly exploring its possibilities before proceeding to another section. The advantage of this method of working is twofold. It is easier, in the first place, to persuade a manager to electrify his works when his neighbours are doing the same.

Secondly, if an expensive cable extension is needed and only three or four applications for small motors can be produced, the sales engineer may be able to show by his map that a load up to 100 h.p. is likely to mature within two or three years; it is then more probable that the new cable will be laid and charged against general development. The cost of mains development is really the deciding factor in making the choice between canvassing according to industries and district canvassing.

Keeping Records

As industrial firms are usually slow in deciding on schemes for electrification, however attractive they may be, the sales engineer will always have a large number of schemes on hand, and is in danger of losing sight of some of them unless he keeps careful records.

The filing system employed must be simple, and yet make all the information required easily available. I have found three separate files necessary.

(1) Consumers' record cards.
(2) Canvass maps.
(3) Live business file.

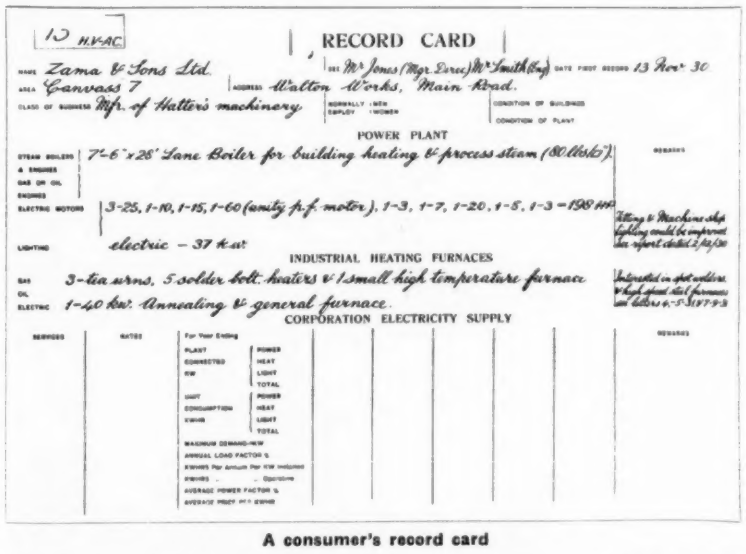
A card is made out for each works where the power characteristics are of sufficient interest to justify a separate record. One of the cards used is reproduced. It will be seen that space is left for a great deal of information to be entered. This is not all necessary in every case, and it is left to the discretion of the sales engineer to decide which items he shall fill in. If a works is steam driven, for instance, any information that can be collected as to the amount of coal burned per week, the tone of the last boiler insurance report, and so on, should be carefully noted down for future reference, even though the firm is not prepared at that time to consider electrification.

Canvass record cards are arranged alphabetically and grouped under industries. As it is desirable from time to time to circularise all firms engaged in a certain trade, this record can be used as a mailing list.

Under each industry there should be a card for the smaller firms whose installations do not justify individual cards. The particulars that can usefully be tabulated for these firms are :—

(1) The firm's name and address.
(2) The manager's name.
(3) The motive power—electricity, gas, oil or steam.
(4) The total h.p. of the drive.

On the canvass map is shown every works within the section with existing motor loads marked by each. A colour distinction is made between existing a.c. and d.c. load, and any new connections that are likely to mature within a reasonable period are marked in red. The positions of network sub-stations and high-voltage supplies are also shown. If the sales engineer's judgment is sound, these maps will be of great assistance in planning mains development. For the same reason they are very useful to the sales engineer in persuading his chief to sanction cable extensions to meet any new business he may obtain.


10 H.V.-A.C.

RECORD CARD

NAME Zama & Sons Ltd. — Mr Jones (Mgr. Direc.) Mr Smith (Eng.) — DATE FIRST RECORD 13 Nov. 30

AREA Canvass 7 — ADDRESS Walton Works, Main Road.

CLASS OF BUSINESS Mfr. of Hatter's machinery — NORMALLY: MEN EMPLOY / WOMEN — CONDITION OF BUILDINGS — CONDITION OF PLANT

POWER PLANT

STEAM BOILERS: 7'-6" x 28' Lane Boiler for building heating & process steam (80 lbs/sq")

A. ENGINES — GAS OR OIL ENGINES

ELECTRIC MOTORS: 3-25, 1-10, 1-15, 1-60 (unity p.f. motor), 1-3, 1-7, 1-20, 1-5, 1-3 = 198 HP

LIGHTING: electric — 37 k.w.

INDUSTRIAL HEATING FURNACES

GAS: 3-tin urns, 5 solder bolt heaters & 1 small high temperature furnace

OIL — ELECTRIC: 1-40 kw. Annealing & general furnace.

CORPORATION ELECTRICITY SUPPLY

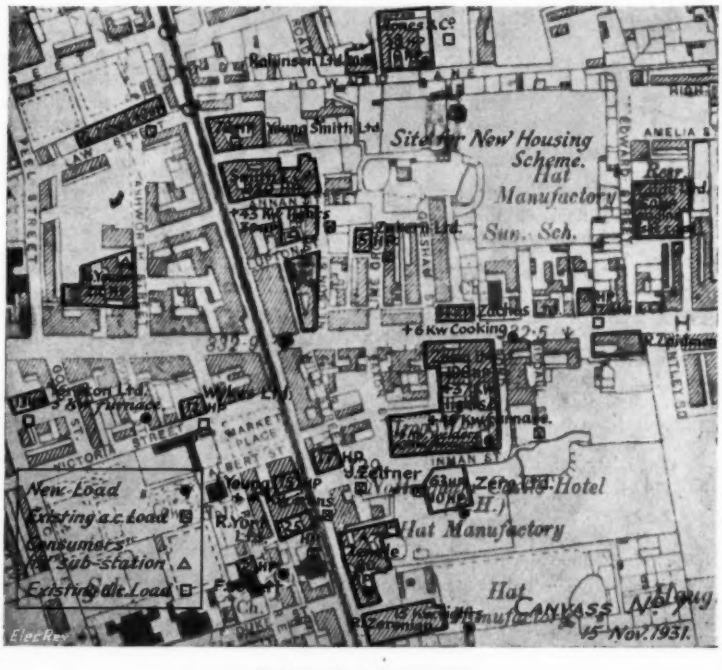
SERVICES — RATES — For Year Ending — PLANT — CONNECTED KW — UNIT CONSUMPTION KWHR — POWER / HEAT / LIGHT / TOTAL — MAXIMUM DEMAND-KW — ANNUAL LOAD FACTOR % — KWHRS Per Annum Per KW Installed — KWHRS — Operative — AVERAGE POWER FACTOR % — AVERAGE PRICE PER KWHR — REMARKS

A consumer's record card

The Live Business File

The " live business " file is the most important record of all. In it a separate folder holds the calculations, reports, and copies of out-going correspondence on each job. A folder should be started immediately the firm shows itself open to conviction in the matter of electrification, and should be retained until the new business has been obtained and the plant is working successfully. It pays to go through the " live business " file periodically and follow up any schemes that are hanging fire.

The sales engineer, if he is a really good man, will find that his value purely as a canvasser is steadily decreasing. As his circle of business acquaintances widens, he will find himself adopted as an honorary consultant and friend at court by an ever-increasing number of consumers. This will leave him little time for canvassing, but his value to his employer will be in no way depreciated. He will probably secure quite as much new business as ever before, and he will be giving consumers a service they appreciate. From time to time, he will be the channel through which complaints reach the supply authority, but such complaints should be the less serious for his handling.



Section of a canvass map

In the days when every factory and mill had its engine and boiler, the manager had, perforce, to be something of an engineer. To-day there is a healthy tendency to buy power from outside, and the energies of the management are concentrated on production. From time to time problems arise that are rather beyond the scope of the works electrician, and are not of sufficient importance to justify employing a consulting engineer. Such cases are the opportunity of the power sales engineer. The two following examples illustrate that a simple investigation may give results of considerable value.

A corn-mill bought power on a two-part tariff which embodied a fairly high fixed charge on the maximum demand. The firm complained that the electricity bills were so heavy as to handicap their business, and asked for some assistance in the matter. A recording wattmeter was installed and charts were taken of the mill load over a period of several days. It proved possible to analyse these charts and discover the load on each section of the plant.

The manager was then able to draw up a new programme of production which, while no less convenient than the old, enabled a reduction of some 15 per cent. to be made in the power peak demand.

In another case a large consumer had a power factor of 65 per cent. and wished to escape a rather heavy penalty by installing corrective plant. It was found that an existing 250 h.p. slip-ring induction motor, which was standing idle in the shop, could be used for an 80-h.p. drive. With the addition of a small exciter this machine was capable of providing magnetising current sufficient to improve the power factor of the works to 75 per cent., and the whole cost of the alteration was saved in three months' running.

Not only has the supply industry to advance, but it has also to guard against the danger of losing ground.

X-ray Crystal Analysis. By G. Cadogan Rothery

SOME eighteen years ago X-ray crystal analysis was applied in England to the investigation of industrial problems and was at once adopted on the Continent, where it has been widely developed. In England, the country of its introduction, X-ray work has been largely confined to pure research, its industrial application being left very largely to the National Physical Laboratory under the direction of an X-Ray Committee, the chairman of which is Sir William Bragg, F.R.S., appointed by H.M. Department of Scientific and Industrial Research. A report of this Committee has been recently issued which gives a brief account of its work.

The body of research work carried on in connection with the electrical industry is considerable. It should, however, be first pointed out that one of the early revelations of the X-ray was that the majority of solid substances are more or less crystalline and that the crystallites within a crystal aggregate change their orientation according to the treatment to which the substance is submitted. Now, it is possible to follow this change of crystal pattern step by step during a technical process and observe changes of structure resulting from chemical, thermal or other treatment. It is also to be noted that in some substances the elementary crystallites are so minute as to be beyond the field of the microscope, while they do not necessarily bear any relationship to the visible particle.

Early Work on Metals

Much of the early practical work was devoted to the investigation of metals, especially steels and alloys, and this led to the consideration of the possible help that X-ray crystal analysis could render to the electrical industry. It was shown that this was considerable in relation to questions touching upon the electrolytic deposition of metals, where there is often marked selective crystal orientation. This is found to depend upon the current density and on the nature of the electrolyte. By variations of these, deposits of different character are obtained differing from random distribution to highly oriented deposits. The X-ray photographs help in the study of these factors and their control to a definite end.

Application to Non-metallic Substances

This selective orientation of crystallites is not peculiar to metals; it is also found in rubber, cellulose and silk, which has been of use in researches into the characteristics and qualities of insulating materials. As regards rubber, in an unstretched state it shows little evidence of crystalline structure, but when stretched a diffraction pattern appears showing crystallites having a direction parallel to the direction of stretching. This is found to correspond to a close connection between structure and physical properties. Much the same has been proved in connection with asbestos, layers from upper and lower deposits differing, as betrayed by the X-ray photographs.

The National Physical Laboratory, in co-operation with the Electrical Research Association, has been studying other insulating materials, including ebonite, bakelite, and insulating papers. The two first only show diffused diffraction halos, betraying their amorphous nature, but the papers give definite patterns, the crystals of the cellulose tending to orient on a plane near the plane of the paper. It is hoped that this may lead to improvement in this type of material.

Examination of Magnet Steels

Probably the most outstanding investigations in this field are those relating to permanent magnet steels, particularly as to their magnetic "spoiling" and "recovery." One point established is that tungsten magnet steels heat treated at temperatures between 900 deg. C. and 1,000 deg. C., on subsequent hardening and magnetisation, show a serious drop in coercive force as compared with steels not so treated, yet, by a brief reheating at 1,250 deg. C., their magnetic quality is recovered. X-ray examinations go far to explain this, the diffraction patterns of good, spoiled and recovered steels showing marked differences.

A tungsten steel before hardening and magnetisation gives an X-ray pattern with lines of alpha iron; "spoiled" after treatment at 900 deg. C., the pattern is complicated by lines additional to the X-iron lines, indicating the presence of crystalline bodies other than iron; on "recovery," after retreatment at 1,250 deg. C., these additional lines disappear. These extra, non-ferrous lines also appear when the steels are water quenched at 850 deg. C.

Other steels have also undergone similar investigation in connection with magnetisation and we are promised a report on the results obtained. As regards the tungsten steels, it would appear that the extra lines are due to the formation of tungsten carbide and a mixed carbide (WC) of tungsten and iron, whose chemical formula is approximately Fe_4W_2C. The relative proportions of these two crystalline bodies depend upon differences in heat treatment. It is clear that one carbide grows at the expense of the other. The importance of this is seen when we find that in a set of steels heated in nitrogen to 1,250 deg. C. and quenched at temperatures ranging from 1,000 deg. to 800 deg., those quenched between 1,000 deg. C. and 850 deg. C. showed only traces of carbide lines, while those quenched at 800 deg. C. showed both sets of lines, with the tungsten carbide predominating.

On the other hand, steels subjected to one hour's heat treatment at temperatures of 1,250 deg. C., 1,150 deg. C., 1,025 deg. C., and 900 deg. C., and slowly cooled in the furnace, gave no trace of carbide in the first samples, while both sets of carbide lines appeared in the other steels, the mixed, tungsten-iron, carbide lines increasing continuously as the annealing treatment fell from 1,150 deg. C. to 900 deg. C. In addition to the alterations due to the presence of carbide, heat treatment influences the size of the elementary iron crystals. Crystal size is influenced both by degree of temperature and duration of treatment. Hardening leads to reduction of grain size and better quality of magnet steels.

Other investigations still being carried on are a method for detecting structural differences between high grade transformer steels of varying magnetic hysteresis loss, and the reason why the temperature coefficient of electrical resistance of constantan wire is changed when the wire is drawn down to fine diameter. As to this last, it already seems proved that the phenomenon is due to differences in crystal orientation.

Electrolytic Processes

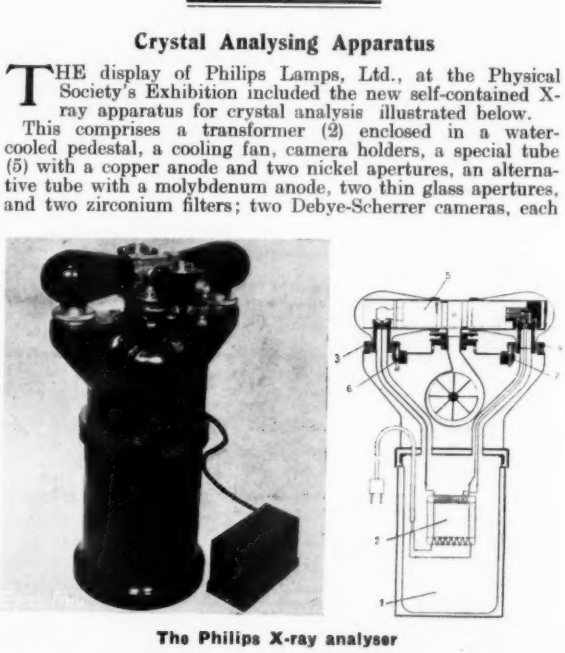
Another line of research which appears full of promise relates to electrolytic processes. The deposits under X-ray investigation show distinct selective crystal orientation, the degree of orientation depending upon current density and the nature of the electrolyte. The phenomena are easily controllable, and it would now seem to be a matter of deciding cost and durability of different types of deposit, and their relation to crystalline formation.

A weak point in this method of research is that X-ray work is mainly confined to physicists, often lacking in specialised knowledge. An electrician manipulating the X-ray apparatus would often be in a better position to appreciate questions at issue, quickly interpret results obtained, and so either narrow or widen investigations. Most of the work at present has to be done by two experts, more or less in sympathetic touch.

Crystal Analysing Apparatus

THE display of Philips Lamps, Ltd., at the Physical Society's Exhibition included the new self-contained X-ray apparatus for crystal analysis illustrated below.

This comprises a transformer (2) enclosed in a water-cooled pedestal, a cooling fan, camera holders, a special tube (5) with a copper anode and two nickel apertures, an alternative tube with a molybdenum anode, two thin glass apertures, and two zirconium filters; two Debye-Scherrer cameras, each



The Philips X-ray analyser

with two diaphragms and three specimen clamps, a switch with plug, cables, and three-pole earthed wall socket for direct connection to 220-V a.c. mains; the consumption is 450 watts and the current 2.8 amperes. The X-ray tubes are interchangeable, by unscrewing the nuts (3, 4) which reveals two plungers (6, 7) beside the high-voltage sockets in the case. One of them automatically adjusts the current and voltage for each tube, and the other interrupts the primary circuit of the transformer when the tube is removed. Each tube has an earthed metallic covering. Once the apparatus has been earthed all external parts can be handled with perfect safety.

H.P. Plant in California

Two 50,000-kW sets in a San Francisco station operated at 1,250 lb. per sq. in.

BY G. S. MITCHELL

INCREASING load in the vicinity of San Francisco Bay has necessitated a complete remodelling of the power station operated by the Pacific Gas and Electric Company in the City of San Francisco, which was first placed in operation in 1901.

This station is the first in the Western United States to use a boiler pressure of 1,400 lb. per sq. in. It is intended to act as a supplementary power source to the hydraulic generating stations of the Mokelumne River system.

Station A has been designed to accommodate four 50,000-kW turbo-alternators operating at 1,250 lb. per sq. in. and 800 deg. F. Two of these sets have been installed and are in operation.

The 1,400 lb. per sq. in. Boilers

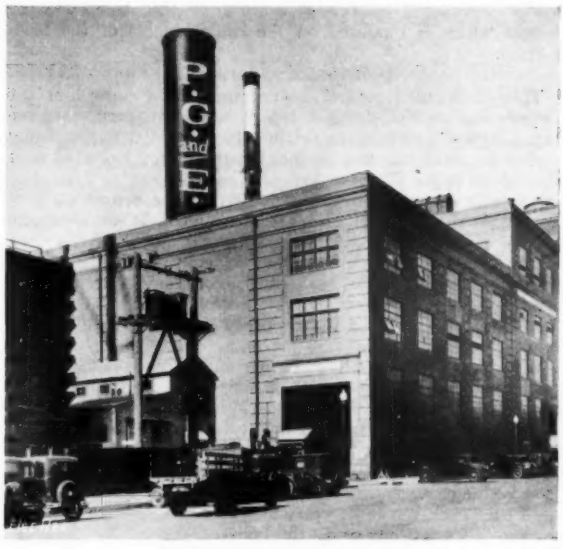
The old boilers were removed to make room for three Babcock & Wilcox boilers of the single-pass type, each with an evaporative capacity of 500,000 lb. of water per hour at 1,400 lb. per sq. in.

Each boiler is equipped on all four sides with a water-cooled furnace wall. The boiler drums are supported on the structural framework, being attached by U bolts, 5 in. in dia., at each end. The drums have an outside diameter of 60 in., and their walls are four inches thick; they are single forgings, 51 ft. long and weighing seventy tons. Boilers and turbines operate as individual units, the third boiler serving as a spare. Each of the two boilers in normal use is equipped with a live-steam and a flue-gas reheater. All boiler equipments include air pre-heaters and economisers.

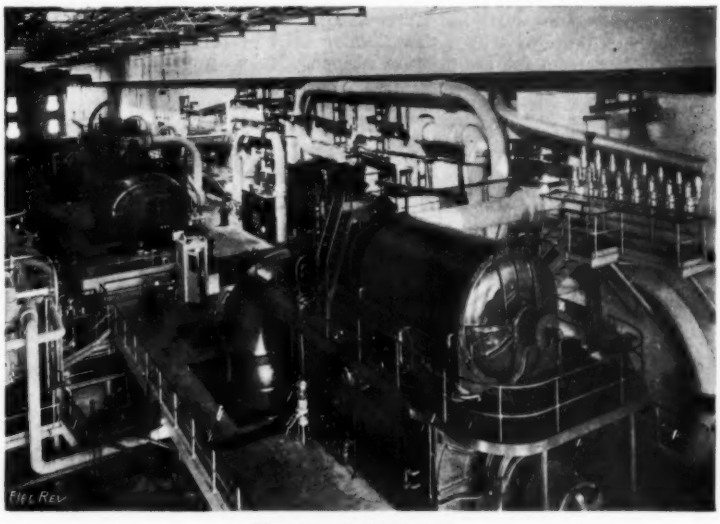
The boiler furnaces are each 16 ft. deep, 42 ft. wide, and 21 ft. high, resulting in a total furnace volume of 14,400 cu. ft. The reheat boilers are equipped with twenty-six combination gas and oil burners, and the spare boiler with twenty-two burners. The burners are designed so that a change in fuel may be made readily. Under full-load conditions each of the reheat boilers will burn 562,000 cu. ft. of natural gas per hour.

A forced-draught fan, delivering 680,000 lb. of air per hour at 15 lb. pressure, is installed on each boiler, and is driven by two motors, one of 150 h.p. for slow-speed and the other of 600 h.p. for high-speed work. An induced-draught fan is also provided for each boiler, operating at 15 inches w.g. and capable of delivering 760,000 lb. of flue gas per hour. This fan is also equipped with two motors, a slow-speed motor of 350 h.p. and a high-speed one of 1,100 h.p.

The air delivered by the forced-draught fan is pre-heated to a temperature of 470 deg. F. Gases of combustion are sucked over the superheater, through the flue gas reheater, through the economiser, and lastly through the air pre-heater, and are then discharged into the stack by the induced draught fan.



"Station A," San Francisco



The two 50,000-kW sets

A combustion control panel is centrally situated between the two service boilers, and contains water-flow meters, steam-flow indicators, fuel valves, and indicators which show the positions of various induced-draught vanes. A selector switch permits various operating conditions from full manual to full automatic control.

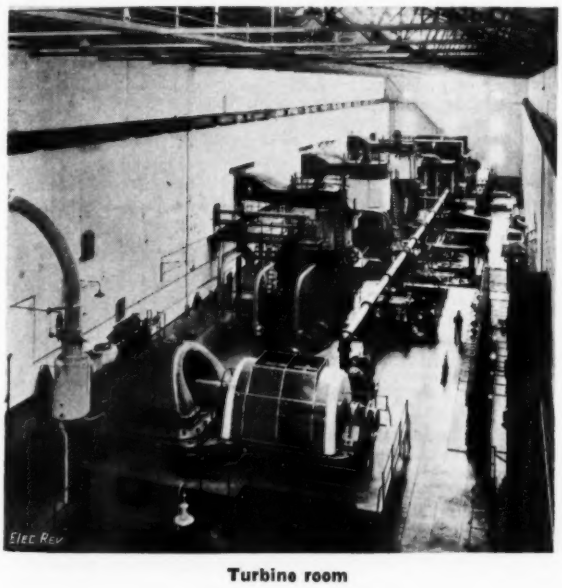
By the Bailey combustion control system a constant relation between fuel flow and air flow is maintained at all times. Variations in steam pressure control the flow of fuel into the boiler, which in turn is responsible for a change in velocity of the flue gases. In combustion tests made upon the installation, the air flow for the maximum efficiency of combustion was determined, and the metering and operating equipment was set to correspond to the calibration thus obtained.

Feed-water Control

Feed-water level is controlled by the recently developed Bailey-Selsyn hydraulic system, the installation being the second of its kind in the United States. The basic idea is that steam withdrawn from the boiler shall be replaced immediately by an equal amount of water.

The steam-flow meter, water-flow meter, and the water-level indicator are mechanically linked and connected to a pilot valve. When the amount of steam leaving the boiler is exactly equal to the water entering, the water level in the boiler drum remains constant and the mechanical linkage remains in balance. A change in any of the three conditions reflects itself in the water-level indicator, which changes the pilot valve by means of an electrical contactor in such a direction as will restore the state of balance.

A hydraulic torque amplifier is used to supplement the pilot valve, moving a Selsyn generator in a direction corresponding to the pilot valve indication. This motion in the "transmitting" Selsyn is conveyed to a similar "receiving"



Turbine room

Selsyn which is mounted on the control valve of the feed-water system.

Fan-motor Operation

This combustion control system includes a control of the forced- and induced-draught fans. Constant-speed, squirrel-cage, 2,300-V motors drive the fans, the draught being varied by changing the position of the vanes mounted over the intake to the fan.

A continuously running motor, driving the centre plate of a solenoid operated double-clutch mechanism, is placed in the control mechanism for the vanes. As determined by the automatic combustion equipment, the solenoid may be energised in either direction, resulting in mechanical contact between the rotating plate and either one or other of the stationary plates in the clutch, causing a movement of the vanes in the corresponding direction.

When this slow-speed motor has moved the vanes to the maximum open position, a set of high-speed cams engages the clutch mechanism, closing the vanes rapidly. Simultaneously with this the slow-speed fan motor is cut out and the high-speed motor placed on the line; the vane movement then operates again. Electrically-driven primary pumps send the feed water through three heaters at a pressure of 600 lb. per sq. in., and steam-turbine secondary feed pumps pass it through an economiser into the boiler.

One of these auxiliary pump turbines obtains steam from a cross-over pipe between the high- and low-pressure main units and exhausts into one of the feed-water heaters. The other, acting as a supplement to the first, obtains steam direct from the boiler through a reducing valve and is used only when steam from the cross-over pipe is insufficient.

Boilers are provided with distilled water only, evaporated by steam bled from the low-pressure turbine. Make up and feed water pass through a de-aerating heater.

All steam piping is supported on a counterweighted system which allows expansion to take place. There are no fixed points between boiler and turbine along the high pressure steam line.

Turbines and Condensers

The turbines are compound. The h.p. cylinder, which is responsible for 12,500 kW of the total output at 3,600 r.p.m., receives steam at 1,250 lb. per sq. in., and 750 deg. F., and exhausts at 310 lb. and 470 deg. F. The exhaust is re-heated to its initial temperature in a flue-gas and a live-steam reheater before passing to the l.p. cylinder which deals with 37,500 kW.

For an output of 50,000 kW, the water rate of each turbine is 8.43 lb. per kWh generated; the corresponding condenser water rate is 5.98 lb. per kWh. One kWh is produced by 9,170 B.th.u. delivered at the turbine. When allowance is made for boiler-house and auxiliary losses the net fuel consumption is approximately 12,000 B.th.u. per kWh.

The condensate is pumped at a temperature of 86 deg. F. through the feed-heating system, which comprises an evaporator, a de-aerating heater, and four live-steam heaters.

The condensers have a heating surface of 34,000 sq. ft. each; they are of the divided water-box type, so that one half may be opened up for maintenance while the other half is in use.

At full load 37,500 gallons of water per minute are required for each condenser. The tubes are expanded into a rigid tube sheet at each end.

The condensate passes first through a heater which raises its temperature to 170 deg. F., after which it traverses a de-aerating heater, emerging at 222 deg., thence entering the primary feed water pump, which forces the condensate through a series of three heaters where the temperature is successively raised to 258 deg., 348 deg., and then to 407 deg. F. At this temperature it is forced into the economiser and thence to the boiler by the secondary pump. A flue-gas heater raises the temperature to 525 deg. in the economiser.

The pumping station, situated on San Francisco Bay, contains two 55,000 and one 40,000 g.p.m. electric motor-driven centrifugal pumps.

The water is drawn from the Bay into a sump near the pumping station, whence it is passed to the power station through a double pipe line consisting of one 60-in. and one 30-in. pipes.

It is intended to install one additional pump at a future date, with a capacity of 65,000 g.p.m., making the total capacity of the pumping station 215,000 g.p.m. Water pipes in the station are installed one above the other, cool water passing through the lower pipe and heated water through the upper.

Alternators and Switchgear

The two alternators run in parallel at 11,000 V. After the high-pressure turbine has been started, the low-pressure unit is motored up to speed by the high-pressure generator current, and is synchronised at the 11,000-V bus-bars, the field being controlled from the switchboard through motor-operated rheostats mounted above the turbine-control equipment.

There are 25 11-kV feeders going out from Station A, in addition to four circuits which feed the transformer banks providing power for the station and for several industrial plants nearby. Double-bus construction is installed throughout, a smaller building having been built adjacent to the main station to house the bus-bars and control equipment.

The h.v. switchgear includes 64 feeder circuit breakers, ten bus-bar section breakers, four 4,000-A breakers to control the new generating sets, and four breakers to control the existing 15,000-kVA sets.

All controls for various circuits are brought into the operating room through a terminal control room located directly below the operating room. All wiring is in conduit.

Operating procedure is controlled from the switchboard room situated above the terminal control room. The switchboard is of the bench type with a vertical panel installed directly behind, upon which are mounted relays and indicating instruments.

Across the room upon a companion panel are mounted the necessary instruments for controlling the feeders. The operating room is well illuminated, a diffusing glass skylight permitting the entrance of daylight; flush-mounted lighting units are installed in the ceiling to provide night-time illumination.

Some Uses for Ozone

THE application of ozone to water purification in England is not so great as in some countries abroad, but in the case of breweries, starch and glucose factories, &c., where a pure water supply is essential, it is frequently necessary to ozonise the water to be used in the manufacturing processes.

The filtering apparatus in use in connection with water supplies will remove most of the suspended impurities from the water, but it is not possible to remove bacteria in this way. The use of ozone in these cases is decidedly efficacious, as it has an advantage over chemical treatment in that it leaves no distinctive flavour in the water nor residual chemicals to interfere with the subsequent manufacturing processes.

Its insolubility ensures against an excess remaining in the water, and in addition to rendering the water sterile it removes all taste and odour due to possible organic defilement.

The water to be treated should first be filtered, to free it from suspended matter, before the ozone is introduced. One thousand gallons of average contaminated water require about ten grammes of ozone, involving an electrical energy consumption of less than 1 kWh.

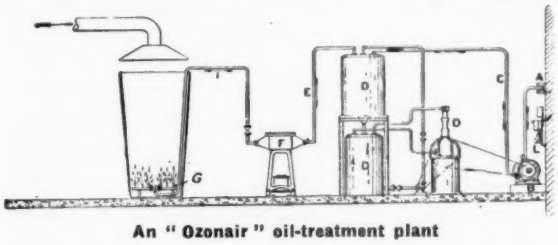
It is usual to blow the ozone in, under pressure, from the bottom of the vessel containing the water under treatment, thus rendering mechanical agitation of the water unnecessary; the manipulation of the water is continuous, untreated water entering the vessel at the bottom, while the treated water flows out near the top.

Ozone is applied to oils and fats intended for edible purposes; in this instance it functions as a bleaching agent by oxidising the colouring matter in the oil, and in this respect it has an advantage over chemical bleaching as it leaves behind no injurious decomposition products.

The oil to be treated with ozone should, preferably, be very low in free fatty acid content, particularly if the oil is highly unsaturated, as, although ozone has no action on the glycerides of saturated fatty acids, it quickly converts free unsaturated acids into fatty ozonides.

Thus oleic acid is converted to the ozonide $C_{18}H_{34}O_5$ and linolenic acid $C_{18}H_{30}O_{11}$. These ozonides decompose in the presence of moisture, producing aldehydes, one oxygen atom from the ozonide combining with the water to form H_2O_2; the latter peroxide, in turn, oxidises the aldehydes to acids.

During the blowing of a pan of heated oil with ozonised air some volatile fatty acids escape and are carried over mechanically with the air current. In cases where the amount carried over is appreciable, the provision of a suitable condenser for these volatile products is desirable.



An " Ozonair " oil-treatment plant

A diagrammatic arrangement of an " Ozonair " plant for the treatment of oils and fats with ozone is illustrated. A is an air cleaner, B a blower, C air delivery pipe, D air cooling and drying machine, E cold air delivery pipe, F ozone generators, and G ozone spray pipes.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Multi-channel Television

AN experimental television system designed expressly (by The Gramophone Co., Ltd., as detailed in our issue of January 16th, 1931, pp. 122-3) to examine the conditions necessary for the transmission and reception of comparatively good pictures is described in the paper which Mr. C. O. Browne read before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS on January 6th.

Five picture channels are used; these accommodate a frequency band sufficient to produce an image composed of 15,000 elements. It was decided to employ cinematograph film bearing the subject to be transmitted mainly because film is plentiful and it enables the conditions existing at any particular transmission to be repeated with comparative accuracy on any subsequent occasion. A further advantage is that it is possible to illuminate film with an arc and, therefore, to obtain more light for the scanning process at the transmitter.

RESULTS FROM FILM

The film is moved intermittently and scanned in two mutually perpendicular directions while stationary. This method was chosen because the continuous-motion method involves the use of gearing between the film and the scanning device which must be so perfect that the errors in the positions of scanning lines do not exceed the width of a line, which is hypothetically the limit of resolution of the eye at the receiver screen. It is doubtful whether after a limited number of traversals of one length of film through the apparatus the accuracy of the perforations would be good enough to satisfy this condition.

In the case of the intermittent motion, however, which is provided by a Maltese cross, the film is stationary during scanning and, moreover, even with a defective mechanism the film obtains identical framing in the gate at every fourth picture.

Although it is difficult to stipulate the number of picture points which should be provided in order to compose a good television image, the 15,000 points provided in the system described were sufficient to show details of a moderately pronounced character as contained in average cinematograph photographs. Whereas sub-titles were resolvable, some smaller details were rather obscure. The method of limiting the field comprised in each photograph and scanning only the centre of attraction was ruled out on account of the loss of interest involved. Further, any attenuation in the transmission or receiving system at the higher frequencies which would cause the system to cut off below the scanning limit of resolution has a detrimental effect upon the received picture. This effect is not pronounced in cases in which the original picture is devoid of small detail.

The arc and Kerr cell receiving system satisfactorily illuminates by transmission a ground-glass screen measuring 24 in. by 16 in., although if desired these dimensions may be increased, with a corresponding decrease in the brilliance of the received image. Comparatively small amounts of distortion only are permissible in the Kerr cells, since this distortion is characterised by a change in colour in parts of the received picture where the distortion takes place rather than by erroneous degrees of shade. The scanning speed of 12½ pictures per second is insufficient, the large received picture augmenting the effect of the flicker at this speed.

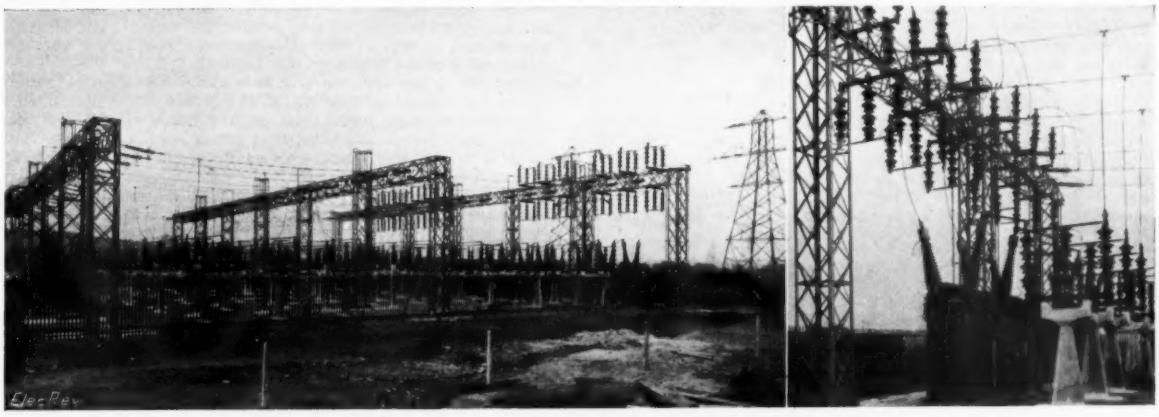
SYNCHRONISATION

Very steady pictures are obtained using 50-cycle 3-phase mains as a synchronising medium, provided that mechanical filters are included between the scanning apparatus and the driving mechanism. In cases in which synchronised mains are not available and a phonic motor is used, damped mechanical filters containing two sections would appear to be necessary.

Synchronising by means of 1,250-cycle signals is satisfactory, although hunting between adjacent poles of the phonic motor caused some difficulty. This was due to the presence of backlash in the reduction gearing, but would otherwise have been removed by the damping of the spring coupling. An effective remedy was to mount the d.c. motor directly upon the mirror-drum shaft and to provide the former with an auxiliary flywheel.

Cable Telegraphy Methods and Equipment

THE paper which was read by Messrs. H. Kingsbury and R. A. Goodman on January 7th at the INSTITUTION OF ELECTRICAL ENGINEERS explains the conditions governing the activities of telegraph companies operating long submarine cables, their position in relation to the governments of the European countries that they serve, and the methods by which traffic in urgent classes of message is handled. The equipment of the different types of station and office that comprise an international system is described, and emphasis is laid upon recent tendencies in speeding up the transmission of a message in all its stages, with particular reference to the Atlantic routes.



General and detail views of the Wakefield grid sub-station. (*See page* 52)

Notwithstanding the rapid strides made within recent years in radio-telegraphy and in international telephony, there is still life and growth of a very vigorous type in the older field of submarine telegraphy, and although the merging of the most important British cable and wireless interests, resulting more or less directly from the success of short-wave radio telegraph links, has been an outstanding feature of communications organisation, there is no sign of a general supersession of transoceanic cable telegraphy by radio for economic or other reasons.

The authors contend that persistent attention to the requirements of the "flash" cablers and the gradual development by the Atlantic companies of a traffic organisation to deal with them will, by indicating ways and means of simplifying the handling of the less urgent classes of message, ultimately bear fruit in enabling the advantages of telegraphy to be enjoyed by correspondents who are at present content with the ocean mail.

EFFECTS OF STATE CONTROL

The growth of cable communications between the countries of Europe and the rest of the world has been steady and satisfactory, but the immediate revenue accruing to a state from foreign communications is occasionally of greater importance than is the development of a first-class foreign telegraph service.

Many minutes are added to the transmission time of a message by the mere handing over of traffic from one company to another or to a government system. For example, a preferred-rate message from San Francisco to Copenhagen handed in over the counter for delivery in the ordinary way occupies about 15 or 20 minutes from being out of sight of the sender until it is in the hands of the addressee, whereas a sender offering a short telegraph message by telephone in New York for London is reasonably certain of delivery in two minutes from the moment of completing dictation of the message in New York.

There is a growing preference among the countries in the interior of the Continent for direct radio services to distant countries, thus avoiding transit agreements with the surrounding countries. Cable services to Central Europe could easily compete with the direct beam, provided that the operating company had control of all stations and that land lines were available and constantly supervised and maintained in proper working order.

AUTOMATIC TRANSMISSION

There are 10,000 Government Inland Telegraph offices in this country. The equivalent of a page of *The Times* can nowadays be sent to New York in one and three-quarter hours; a single loaded cable is capable of such work with proper distribution among the channel operators. The stockbroker is, however, better served by the so-called "slow" non-loaded cable; the terminal processes are of major importance. Nowadays "ordinary" delays are seldom greater than 30 minutes; frequently they are of the order of 10 to 15 minutes even in the busiest hour.

Transmitter operation on main cable routes consists almost universally in keyboard perforating by touch. A properly trained and experienced operator will deal with 10-letter unpronounceable code traffic, with little more effort than ordinary plain language, on circuits running at 300 letters per minute or more, which means a maximum speed considerably higher to avoid any risk of stopping the transmitter; this is physically impossible except by the touch-typing method. The punched tape from the perforator passes immediately through the automatic transmitter, which in all regenerator circuits is of the synchronous or phonic-wheel type.

The skilled operator punches at a steady average equal to the speed of his cable and keeps no more than a foot or so of slip on which the transmitter can draw. So far as avoiding "storage" is concerned, nothing quicker has yet been devised than a practised operator with a typewriter keyboard under his fingers and the siphon of a direct writer under his eye.

SAFETY AND RELIABILITY

It is the claim of advocates of cable telegraphy that it enjoys a degree of security and dependability not hitherto enjoyed by radio-telegraphy, whether short-wave beam, or high-power long-wave. The capital sunk in plant in a modern radio link may be very much less than that sunk in a cable of equal traffic capacity. The annual charges, however, will not be less to the same extent, and in the present state of the wireless art the dependability expected by the "preferred-rate" cabling public cannot be given at the rates now charged by the cable companies. In time, no doubt, radio service will draw level with existing cable standards for "ordinary" traffic, but at present there are few routes for which even this can be claimed.

The extent to which it is necessary to query messages or words in the regular business of the cable systems may be judged from the fact that only about 0.5 per cent. of the messages transmitted in an average day have to be re-run for this reason.

FUTURE OF THE TELEPRINTER

Like most other branches of commercial activity, cable communications do not thrive without cultivation, and service must be offered of other kinds than mere performance in return for payment. The cabling public has to be sought and means of collection and delivery of its messages must be provided of such a kind as will meet individual convenience. The time is seemingly not far distant when the teleprinter will be a common addition to the office furniture of a large firm, as a means of telegraph communication with both home and foreign correspondents. It is not without interest that the earlier use of the teleprinter in this country was in connection with cable office traffic.

Ocean cables will probably never be regularly leased as private wires, although they will sooner or later have to serve as trunks between two teleprinter exchanges. The basis that has existed internationally from the beginning of telegraphy, which differentiates it fundamentally from telephony, is that the operating company undertakes to convey messages at agreed charges per word, and over long distances lower rates are obviously possible by this means than by a system of putting parties into communication for agreed periods. But the strict basis has necessarily been abandoned in the transmission of pictures by cable and will be similarly abandoned, should the need arise, in order to provide a new service of the kind described.

Why Line Insulators Fail

SOME of the hazards to which overhead-line insulators are subject in service are considered in the paper which Mr. R. C. Anderson read before the London branch of the ASSOCIATION OF MINING ELECTRICAL ENGINEERS on January 5th.

Depreciation is a serious phenomenon of which little is known in this country owing to the fact that most of our overhead networks are of relatively recent construction. It is explained that unless the fundamental characteristics of porcelain, cement, malleable cast iron, and steel are intelligently harmonised in the assembled insulator, the porcelain will crack in service.

The crack will in time wander through the body, very materially lowering its dielectric strength, and then on the slightest provocation (even a normal switching surge) the insulator will puncture. When that occurs the insulator is said to be depreciated.

Actual records of a number of systems have shown that cracking, far from being a myth, is a very real occurrence which brings in its train very substantial financial losses due to interruptions. These losses, it is well to observe, may easily run into thousands of pounds on a sizable system in even two to three years.

FAULTS IN SPECIFICATIONS

It has been shown that cracking is due to faulty insulator technique that completely, or partially, disregards thermal stressing in service. Furthermore, that this disregard can be, and generally is, fostered by specifications that are devised to ensure high electrical, electro-mechanical, and purely mechanical characteristics in a test room. The drafting of these specifications is inspired by the belief that a good test insulator must *ipso facto* be a reliable insulator in service. Few engineering beliefs are more fallacious, and it is to give point to this contention that the seemingly outrageous statement has been made and repeated that only the minority of suspension insulators in service have a factor of safety of 2 under all operating conditions. The statement is worthy of very serious consideration by all operating engineers, whose responsibilities, without being harrassed by insulator troubles, are already extremely onerous.

Fortunately, as operating data have demonstrated, the depreciation problem has effectively been solved, but it has required a number of refinements to do so. Resiliency of assembly is absolutely vital, but it must be borne in mind that this resiliency, while it results in insulator longevity, mitigates against high electro-mechanical test figures.

A SMALL, BUT VITAL, PART

Thermal stressing is responsible for some 90 per cent. of insulator failures, so that reliability in service can only be assured by those shapes and assemblies which have been designed and manufactured effectively to counteract the dire effects of thermal stressing.

The outlay on insulators in a complete scheme represents but a very small proportion of the total cost. Yet on their efficiency, perhaps more than on any other single item, the financial success of any important power supply depends. This being a fundamental fact, universally accepted as correct, the author submits that the slightly increased expenditure involved in obtaining insulator refinements is absolutely justified on the score of sound economics.

Wakefield Grid Transforming Station

Some details of the principal point in the Mid-East England Scheme

THE 132-kV transforming station at Wakefield has recently been tested and handed over to the Central Electricity Board. It is the key station of the Mid-East England Electricity Scheme, since it is common to the two rings in that area, one of which includes Bradford, Kirkstall, and Thornhill, and the other Blackburn Meadows, Rotherham, Lincoln, Grimsby, Hull, York, and Ferrybridge. Moreover, any interchange of power between the three adjacent areas (S.E., N.W., and N.E. England) must pass through the Wakefield station.

The structure consists of three main steel gantries, each including six main bays about 27 ft. wide; the supports are 40 ft. high. The 'busbars are supported on post insulators carried on concrete structures running parallel with the steelwork (the connections strained between gantries shown in the illustration on the previous page are by-pass connections) the main and reserve 'busbars are joined by an oil circuit breaker, placed opposite to the end from which the station can be extended.

The incoming feeders enter through underslung isolators to the oil circuit breakers and thence through the 'busbar isolators to the by-pass connections. An alternative path is formed by the by-pass isolators on the tops of the gantry. Earthing switches are provided to close on the line side of the 'busbar isolators.

Isolators are of the rotating-post gang-operated construction, and are built up on tubular-steel bases. A five-post construction is used for the transformer isolators; the centre post supports the fixed contact for the two isolators and the common point to which is connected the transformer breaker. 'Busbars and other rigid connections are of copper-clad steel of 2½ in. outside diameter, and strained connections are built up in tubular strands, the object being to prevent excessive corona with a minimum quantity of copper.

The 132-kV circuit breakers are of the 600-A single-pole explosion-pot type with a rupturing capacity of 1½ million kVA; the weight of a three-pole unit with oil is 25 tons.

Three of the four feeders are protected on the impedance system. For the fourth feeder, which is less than ten miles long, the "Translay" pilot system and stand by overload is employed. The bus-coupler has inverse time overload protection, and the transformer overload and restricted earth leakage relays on both h.v. and l.v. sides. The three single-phase non-resonating potential transformers for operating the impedance protective gear are connected each set to its appropriate feeder, and are covered by the line protection; each single phase unit is provided with a conservator.

The entire switchgear at Wakefield was supplied and installed by the British Thomson-Houston Co., to the order of the Central Electricity Board, with Messrs. Merz and McLellan as consulting engineers.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

The Installation Problem

I should like to be amongst the first to congratulate Mr. W. R. Rawlings for saying in so courageous a manner what most practical installation men are undoubtedly thinking to-day. His article was one of the most broadminded and encouraging of its kind that it has ever been my pleasure to read, but all who know the author would expect just these characteristics to emerge.

His appeal for compulsory wiring rules for a minimum standard must command the attention of the industry; the compilation of these rules will not, however, be simple, but with a lead such as Mr. Rawlings has given some of the initial obstacles have been cleared in one bound, and further development of the matter will simply have to follow. I should like to see the Electrical Contractors' Association as a body behind Mr. Rawlings's proposals, and as chairman of one of the smaller branches I should like to offer whatever influence I may possess towards achieving this end.

I must thank Mr. Rawlings for his kind reference to the efforts which I have put forward to secure the consideration by the industry of automatic trip protection, in which I am a firm believer, and which I am certain will solve many of our problems of adequate protection for simpler installations, if not all of them. In fact, this system of protection is the only one that can possess *any* efficacy for our simpler (dare I say *cheaper*?) installations, whilst for the rural installation it is the only *possible* one. I do not propose to elaborate the system here, however, as that has been done elsewhere, but Mr. Rawlings's brief reference to it will undoubtedly assist in its unbiased consideration by the whole installation trade.

Mr. Rawlings's remarks concerning the retention of the fuse are well to the point, but I regret that I cannot follow him in his advocacy of the use of uninsulated-neutral wiring systems, presumably concentric, although there may be thousands of installations using this system. While possibly electrically correct, these systems appear to be mechanically unsound, a point which is of almost equal importance where quick and cheap installation is required, due mainly to the many hundreds of clipped or soldered connections in the uninsulated outer. In fact, during the recent revision of the Canadian Electrical Code, following a search for cheaper wiring systems, the concentric system was definitely rejected, on the ground that "difficulties in making a continuous electric sheath from joint to joint were apparent in this method."

Electrical perfection may demand some such wiring system, but to my mind the problem is the provision of simpler, cheaper, and more reliable installations, which means the revision of our ideas of what constitutes adequate protection and possibly the throwing overboard of many of our cherished ideals.

The combined efforts of electrical installation men will surely solve this problem and eliminate the terribly shoddy work which to-day masquerades as wiring, and is openly encouraged by so many supply authorities throughout the country. Whatever the installation methods eventually evolved, nothing but the highest standard of workmanship can ever be countenanced, as it is in this factor that the whole difference between a sound or an unsound installation lies.

Folkestone, *January 4th*, 1932. T. C. GILBERT.

The Contractor's Job.

No one can deny that Mr. W. Gore Graham's article in your issue of November 20th is full of information for electrical contractors and their apprentices. Young engineers or wiremen who intend to be contractors some day should keep his contribution for future guidance.

Perhaps I may be allowed to discuss some of his points and to mention similar experiences gained in Egypt. It is a pity that in this country there are no special supply rules or regulations for the wiring of houses, except that the supply authority's engineer must make an inspection and that frequently not a keen one, to see whether the wiring is in good order or not. On the other hand, public buildings such as cinemas, theatres, hotels, &c., which are under the supervision of the Ministry of Interior, are subject to certain rules. The installation is carried out only after the Ministry has approved the layout of the circuits on each floor, three diagrams of which have to be submitted.

Further, installations in government buildings are also subject to regulations and approval by the responsible authorities. Briefly these regulations provide:—

(1) That not more than five circuits may be connected to the fuseboard by one circuit of twin insulated wire 2×2.5 sq. mm. in lead-covered tubes 13 mm. diameter.

(2) That the current density should not exceed 1 amp. per sq. mm.

Before reading the article, I had no idea about the "price per point" in England, or at least I imagined something from 20 per cent. to 25 per cent. dearer than the price per point in Egypt, owing to the higher labour costs. As a matter of fact, the 18s. 6d. per point, mentioned by Mr. Graham, would be more than acceptable for such a case in Egypt, where the price may be as high as 14s., and may be as low as 7s. 6d.

Contractors ought to be able to quote more than that and secure the job. In Egypt, as in England, a vast army of contractors have risen up who are mostly ex-wiremen and will therefore be contented with small profit and be in keen competition with modern qualified contractors who have much greater expenses.

Mr. Graham mentions that the cheapest method of wiring a modern bungalow is by slip conduit at a charge of 11s. 6d. per point. I have not seen any bungalows except in pictures or in the cinemas, and the name means a country house in India, but it seems to me that such an installation would be a poor one for the price per point.

Competition for installation work in Egypt is so strong that some contractors take work at a price which only covers the actual expenses. The Egyptian market is flooded with German materials which are far cheaper than British, but British lamps and some other goods are recognised as the best. The cost of labour is comparatively low which reduces the price per point.

We have here some keen customers who only pay the cost of labour, say 3s. or 4s. per point, they themselves buying the wires, fittings, &c. I wonder whether such cases occur in England.

Cairo. S. A. ASHMAWY.

Still the Boiling Plate

I have read Mr. Veitch's letter in which he states that I rather misunderstood his previously expressed views, and that the present enclosed hot-plate is efficient with special utensils. As a matter of fact I do not think there is any misunderstanding, and I am not inclined to agree with the latter statement either.

In the first place the efficiency of the combination is not high, and this only holds good so long as sound thermal bedding is preserved. As it has already been mentioned by others that plates warp, &c., to say nothing of similar deterioration in utensils, it is manifest that an efficiency of this kind is not of great practical value.

The fact that 75 per cent. of cookers are being supplied without special utensils does not alter my views, and might indicate that the experience of others is that the public will not be bothered with these things. The symposium of views expressed by various engineers and appearing in the same issue is interesting, but similarly does not alter the case as they have to put up with what is available and make the best of it. The fact that they advise special utensils shows sound judgment in the circumstances, but is no compliment to the boiling plate.

To sum up, it would appear that some people would have us cover up the shortcomings of this contrivance and convince ourselves that progress and new ideas in these matters have come to a definite end and that the present arrangements are the best that can be managed. It is not a little surprising if this is so, especially in view of the various outbursts upon popularising the use of electricity; the amount of good that improvements in such lines could bring about is quite significant.

On the other hand, it may be that the time is not yet ripe for attempting such improvements. It would seem that this is so, as, after close application to such matters over a lengthy period, I find that makers show no inclination to improve either boiling plates or fires, and a smoothing iron that does the work better with half the loading fails to arouse the slightest interest.

Anyway, the position now appears to be that the progress of the present-day cooker is held up by the hot-plate, which is inefficient, liable to damage, inconvenient due to requiring special utensils, and badly regulated, and that with the exception of a few instances nobody is interested in its improvement. It plays a bad second fiddle to the gas ring which is a none too wonderful device either.

I am not blind to the fact that the apathy shown in this country towards a little research and alteration is practically universal, and the heating line is not the only one to exhibit such symptoms, as improvements in signs, switches and other lines have similar difficulty in getting noticed.

CHARLES E. BAXTER.

Huddersfield, *January 2nd*, 1932.

Electric Clocks

I cannot agree with Messrs. Everett Edgcumbe & Co., Ltd., regarding the field of usefulness of the synchronous public clock; in fact I would suggest that this is essentially an instance where the synchronous type should *never* be used, for two reasons.

A public clock must be a good timekeeper and it must never stop. However good a synchronous clock may be, its timekeeping is entirely in the hands of the power supply company, to whom the distribution of time is an incidental matter for which it assumes no responsibility. This is not a comforting thought for those responsible for the clock's erection and maintenance.

Again, interruptions of supply are bound to occur, and one has only to think of the damage to the electric clock industry which would result from such a headline as the following

appearing in one's evening paper: "*Town Hall Clock Stops Again—Third Time in Three Months.*" Even if the occasional interruption of supply can be tolerated, someone must be appointed to re-set the clock when such a failure does take place.

Impulse clocks, on the other hand, are independent of any outside interruption and can be regulated to keep time within a few seconds per month. If superior accuracy is demanded they can be readily adapted to be connected *directly* with Greenwich Observatory and synchronised once or twice daily. If no impulse time circuit is available to which the clock can be connected, the provision of a special master clock entails comparatively little additional expense. The pendulum of a mechanically driven clock can also be readily controlled from an electric master clock, or it can be synchronised by the Greenwich time signal.

Referring to street lamp service; in their enthusiasm for the synchronous clock your correspondents appear to have overlooked the fact that the electrically wound time switch can just as easily be fitted with a solar dial and so eliminate weekly setting. So far as performance is concerned, a faulty electrically wound time switch only affects its own particular lamp. An interruption of supply, on the other hand, disorganises the timing of *all* the synchronous time switches in the district affected. From the point of view of efficient service the electrically wound time switch is therefore to be preferred.

S. F. PHILPOTT.

Swindon, *January 2nd*, 1932.

Diesel-electric or All-electric?

I am sorry if my attempt to write an unbiased article comparing Diesel-electric and all-electric locos. should have been construed by Mr. Adam Gowans Whyte to be in favour of the former for the English railways. I have recently returned from the tropics, and must confess that when I wrote of main line traffic I had in mind railways where the traffic is much less dense than in England.

I have given reasons for my comparisons between Diesel-electric and all-electric systems, but Mr. Whyte says that my statements will not bear a moment's examination. Needless to say, I shall be very interested to receive further information on this subject, but his letter does not give anything really definite in support of his statement.

I realise that it is not always easy to obtain accurate figures, but perhaps he could give some approximate figures comparing the costs of the two systems for the English railways, which I am sure would interest a large number of readers.

H. C. HARRIS,

Wembley, *Dec. 30th*, 1931. (*Ex. B.B. & C.I. Rly., India*).

A Telephone Problem

In the Parliamentary Notes in your issue of December 4th it is stated that Sir Kingsley Wood informed the House of Commons that about 31 per cent. of subscribers' lines in the London area had now been converted to automatic working and, with regard to future progress, that "the past average had been about 30,000 lines a year."

On page 860 of the same issue mention is made of the growing popularity of the telephone service, both in London and the provinces, and the total increase during the year in the number of new telephone installations in the London area alone is given as 41,525.

Can any of your readers suggest the method of calculation employed by Sir Kingsley Wood when he further stated that "conversion of the London telephone system would, in accordance with the present programme, be completed within the next ten or twelve years"?

Coventry, *January 1st*, 1932. S. FLINT.

Automobile Electrical Service

IN recent years automobile-electrical repair shops in this country have multiplied at a rate which can have few parallels in the electrical industry, and when one considers the ignorance of most garage staffs regarding electric ignition and lighting, it is not surprising that they flourish exceedingly.

The knowledge and skill required for this work is extensive and peculiar. A considerable acquaintance with petrol-engine tuning and fault diagnosis is called for, without which it will sometimes be impossible to say whether given trouble is electrical or not. The theory and construction of all types of magnetos, dynamos, coils, starters, and batteries must be studied so far as is necessary for locating and rectifying faults. Above all, perhaps, it is essential to have a clear conception of the various means by which variable-speed dynamos are automatically regulated.

Naturally, it has not been easy to find enough men able to meet such demands, as there is very little provision as yet for systematic instruction. The testing equipment of the average English shop has been far behind its American counterpart; indeed we have depended almost entirely upon American sources for the supply of complete running-test benches, some of which have been sold at fantastic prices. Now, however, at least one English firm is offering a most excellent bench and others would do well to follow its example, for the potential field for this apparatus is enormous, including as it does not only the auto-electrical shops, but also a great number of garages. In the United States no self-respecting garage would think of being without one.

The Running-test Bench

These benches vary in their degree of elaboration, but they commonly include such items as a mains-driven reversible motor, giving all speeds between zero and about 3,500 r.p.m.; a 1½-h.p. tachometer and a range of couplings for driving any type or size of magneto or dynamo; a universal vice for fixing the machine to be tested; a switchboard with voltmeter, ammeter, standard spark-gaps, means for condenser testing, and automatic cut-outs for 6 and 12 V; an arm and spring balance for measuring starter torque; and in a few cases the bench is ingeniously combined with a lathe.

Where alternating current is available it is common practice to use a "growler" for the rapid location of armature faults. Most magnetisers found in repair shops seem to be quite inadequate for dealing with the modern cobalt-steel magnets; about 2 kW is needed for the best results, provided the magnetiser is correctly designed, and it is therefore preferable to use the mains where direct current is available.

Magneto Repairs

The recent supersession of the magneto in favour of coil ignition in many cases is not to the advantage of automobile-electrical repairers, who will in future have to look to the lighting system for a larger proportion of their work. A garage which would not think of attempting a magneto repair can easily replace any defective part of a coil set. On commercial vehicles and motor cycles, however, the magneto is still holding its own, and many thousands of private cars will need magnetos for some years to come. At present most repairers find magneto overhaul the most profitable part of their work, although it is not on the whole so exacting as lighting, and some of the ablest are content to confine themselves to it.

The system of charging for magneto overhauls on a flat-rate basis has provoked much controversy, but is still very common. Those motorists who have first-class machines are helping to pay for those (fortunately less common than they were a few years ago) which require to be almost re-made after a season's work.

A rule in the best shops is to use only manufacturers' replacement parts whenever possible, and garages must, of course, have a liberal discount if they are to be regular customers. On the question of guarantees also there is much difference of opinion; some firms give complete guarantees for a year, or longer, while others limit them to the parts repaired, or replaced, and a few give no formal undertaking at all. They argue, with some truth, that conditions of use and inherent reliability vary so much that it is absurd to give a guarantee and also that the finest machine may fail at any time through no fault in the last repair. In any case a guarantee is of far less importance than the repairer's reputation, because in the event of failure the consequential loss, especially if one is stranded "miles from anywhere," is often several times the cost of an overhaul. It is fairly common for magnetos to be supplied on loan without extra charge while a repair is being done, as a comparatively small stock suffices (thanks to the B.E.S.A.) to serve the great majority of vehicles.

Battery Service

Most shops are now equipped with up-to-date constant-potential battery chargers and some remarkably ingenious designs, giving fine regulation without the aid of external regulators of any kind, have lately appeared. Battery repairing can often be made very profitable, but it is less interesting than machine work, more "messy," and subject to various legal requirements.

Not the least important part of a complete service equipment is a comprehensive library of wiring diagrams for all cars sold in England in the past twelve years; they, fortunately, are mostly easy to obtain. Equally important, but less easily collected otherwise than by personal experience, is a set of performance curves and winding specifications of magnetos, dynamos and starters.

Few electrical workers encounter such a great variety of interesting problems as those connected with automobile equipment, and the future of the industry is full of promise. Some of the most enterprising firms are also building up valuable connections with wiring contractors and others for the repair of small electric motors of all kinds. Here is a rapidly expanding field for which they are very well fitted by their knowledge and equipment.—"SPARK GAP."

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Automobile Engine Heater

The EDISON SWAN ELECTRIC CO., LTD., 123-125, Queen Victoria Street, E.C.4, has lately introduced a useful device for keeping the engines and radiators of motor vehicles warm when standing in the garage at night in extremely cold weather, the purpose being to prevent the freezing of the engine cooling water and its resulting damage, and also to facilitate starting up in the morning. The heater measures only 7½ in. by 2½ in., and it is provided with a hook so that it may be fixed under the bonnet of the car. It may be plugged into any convenient lamp socket, and although it is loaded at only 150 W, it serves its purpose in an efficient manner. The device has a strong perforated metal body and is supplied complete with an adequate length of flexible lead and a bayonet connector.

"Ediswan" auto engine heater

Small Oil Circuit Breaker

The "Bantam" oil circuit breaker recently introduced by Messrs. GEORGE ELLISON, LTD., Perry Barr, Birmingham, is a totally enclosed, robust, handle-operated switch rated to carry 15 A at 660 V, and to break 1,500 kVA on a three-phase symmetrical short-circuit. It is made in two- or three-pole models for single- or three-phase, and a four-pole model with two poles in series for d.c. Solenoid-magnet automatic releases are fitted, and the magnets strike a definite blow on the release mechanism and cause the contacts to open precisely at the current values for which they may be set. Close adjustment of solenoids to standard overload release setting is easily effected. The enclosure is a strong cast body with a removable top cover and oil tank.

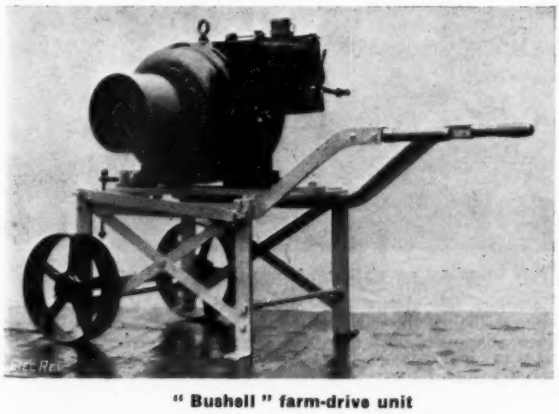
The body is in two parts, with a horizontal machined joint. The lower part carries the contacts, terminals and releases, while the upper part, which is removable to facilitate connecting up cables, &c., carries the handle-operating mechanism. The time-lag and trip adjustment devices are dustproof, and do not require a cover. The terminals and contacts are mounted on a moulded insulation base. A quick-break inching device is fitted. Circuit is made and broken at copper-block contacts, with a clear break of 1¼ in., and these blocks slide over one another to afford self-cleaning and to give good line contact under spring pressure. Although the "Bantam" can be set accurately to trip at 25 per cent. or less overload current, it can be used very satisfactorily as a "direct-on" starter. The time-lag automatically restrains the trip against the starting current and momentary peaks while running, although it will operate practically instantaneously on short-circuit. Electrical interlocks with other gear, cable trifurcating and sealing fittings, a 4-in. dial ammeter mounted on the cover, and an isolating switch in a padlocked box on the breaker can all be supplied as required.

A Portable Farm Motor

The "Bushell" portable farm motor, a product of Messrs. HENRY BUSHELL & SONS, York, made its first appearance recently at the Yorkshire Fat Stock Show at York. It comprises a 5-h.p. Higgs motor, a "Memota" star-delta starter and Reyrolle weatherproof plugs and sockets. Much thought was given in the design stages to the safety of the operator and the speedy adjustment of the motor when in use.

The starter is mounted on the carcase of the motor, to which a weatherproof inlet socket is attached. The starter is fully automatic and fitted with three overload and no-volt releases. An inlet type weatherproof plug is supplied for attaching a four-core c.t.s. flexible trailing cable. The motor is mounted on a robust wrought-iron stand, with a sliding base and belt-tightening gear, and provision is also made for the stand to be mounted on a concrete foundation if permanent fixing is required. Sprags are fitted to the bogie to prevent the motor creeping when used on soft ground. The whole equipment is of British manufacture and made to British Standard Specification.

The makers inform us that it is their intention to manufacture in due course a range of these portable units in from 2- to 10-h.p. sizes for driving practically all types of farm machinery.

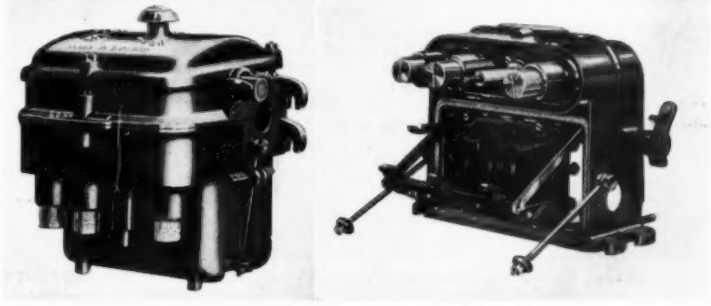


"Bushell" farm-drive unit

Portable Lighting Fitting for Motorists

A recent production of THOMAS A. ROSE & SON, LTD., 25, Milton Street, E.C.2, is the "Servenlite" lighting fitting designed principally for motorists' use—a reading lamp in the saloon or an emergency lamp for breakdowns. It is fitted with a "stickfast" sucker which will hold to metal, wood, glass, &c., and is made in "Bakelite" (green, red, walnut, or mahogany) with a chromium-plated reflector. It is provided with a plug and sufficient flexible lead to enable it to be used anywhere in or around the car and supplied from the dashboard.

The appliance can be readily converted into a ladies' theatre lamp by fitting a "direct-ray" mirror over the front; light is projected through a frosted aperture in the mirror in which the user's image is reflected.



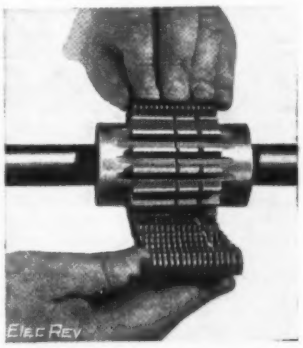
External and inverted views of "Bantam" oil circuit breaker; oil tank removed, showing contacts and moulded base

Flexible Couplings

Flexibility through their design and by the use of flexible or elastic material is the outstanding feature of some flexible couplings recently introduced by the MORSE CHAIN CO., LTD., Letchworth, Herts. Two sprockets, one on either shaft, are wrapped by a "Morse" inverted-tooth chain which is easily coupled up by a chain-joint pin and cotter. The chain transmits the load between the sprocket halves, and on account of the large number of contact points between the link plates of the chain and the sprocket teeth the load is so widely distributed that stress at any one point is small. The joint pins of the chain are flexibly held, and load is divided so that each pin takes its part, even when there is misalignment.

The couplings are machined all over and, being perfectly balanced, are capable of running at high speeds. To meet conditions which will not permit the couplings to be run open, various types of cases are available. A standard range of 14 sizes of couplings for from 0.8 to 158 h.p. at 100 r.p.m. is listed, but additional intermediate sizes and special and light couplings for all purposes are also obtainable. The couplings are normally bored and keywayed to the maker's standard limits, but other limits are provided for if proper gauges are furnished.

The illustration shows the ease with which the coupling can be manipulated.



Assembling a Morse coupling

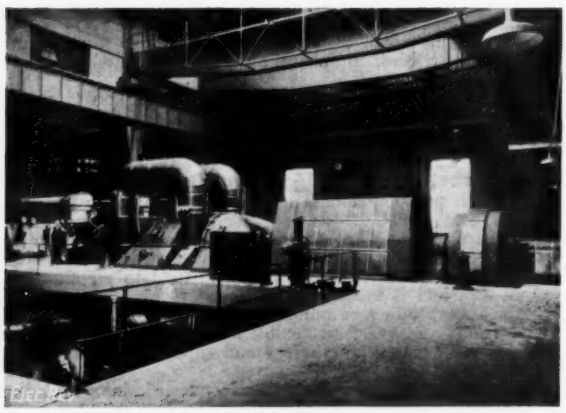
Large Power Plant Production

B.T.-H. developments during 1931

DETAILS of a number of interesting technical developments are contained in a résumé of the activities of the British Thomson-Houston Co., Ltd., during 1931.

Among the important contracts which the company has in hand is that for one of the 67,200-kW turbo-alternator sets for the London Power Co.'s Battersea power station. This equipment, together with another of similar capacity supplied by the Metropolitan-Vickers Electrical Co., Ltd., is now in process of erection. In each case the turbine is of the three-cylinder type designed to operate with steam at 570 lb. per sq. in. gauge and 850 deg. F. total temperature, exhausting into a vacuum of 29.1 in.

A 50,000-kW turbo-alternator for the Ironbridge power station of the West Midlands Joint Electricity Authority is also



One of the two 30,000-kW B.T.-H. turbo-generators at Stourport

in course of erection, while another notable order is that for two 75,000-kW turbo-alternators for the County of London Electric Supply Co.'s extensions at Barking. The latter are claimed to be the largest ordered in Great Britain. The construction of a 30,000-kW turbo-alternator for the Ford Motor Co. will be completed shortly. An order from the Gas Light & Coke Co. for equipment for the Beckton Gas Works comprised six turbine-driven gas boosters, three of a capacity of 3,000,000 and three of 2,000,000 cu. ft. per hour.

Considerable progress was made during the year in the electric propulsion of ships, and three vessels—the *Strathnaver*, *Strathaird* and *Rangatira*—were fitted with B.T.H. propulsion machinery to a total of approximately 70,000 s.h.p. The company also received an order for the seven turbo-generators required for the auxiliary services for the giant new Cunarder about which so much has been heard recently.

As examples of the company's activities in hydro-electric work, two machines for the Grampian Electricity Supply Co.'s Tummel power station are of particular interest. Each comprises a horizontal, duct ventilated type alternator having a rating of 21,250 kVA at 80 per cent. power factor, 300 r.p.m., 11,000/13,000 V, 50 cycles, 3-phase.

Important developments have taken place in the direction of the extension and consolidation of current, voltage and rupturing capacity ratings of existing switchgear apparatus, and a new type of ironclad drop-down switchgear has been designed to meet the demand for heavy rupturing capacity 440-V static auxiliary apparatus. The London Power Co. has placed an order for 116 of these equipments for its new Battersea station. A new small size centrifugal mechanism for use in conjunction with oil circuit breakers having a rupturing capacity not exceeding 150,000 kVA at 11 kV is a further development.

Among notable switchgear contracts received were those for 11-kV sub-station equipment in connection with the Underground Railways extension to Cockfosters, and for switchgear for the Uhl River and Pykara hydro-electric schemes. Ninety-one single-phase, 130,000/110-V transformers have been ordered for direct connection to the transmission lines in the Mid-East and North-East England Schemes, while 210,000 kVA of 132-kV transformer plant is being supplied for the South-West England and South Wales Scheme.

A 1,500-kW, 1,500-V mercury arc rectifier was put into successful operation when the Manchester-Altrincham Railway was opened to electric traction. At present the rectifiers of this type in production include 17 of 1,500 kW each and five of 2,000 kW each for the London Electric Railway Co. and two of 1,200 kW each for the L.M.S. Railway's Barking-Upminster electrification scheme.

Contracts for traction equipment included one from the Ford Motor Co. for three Diesel-electric locomotives of the bogie type, each weighing about forty tons, for use at the Dagenham works. Two electrical equipments for battery train units are being manufactured for operation on the Great Southern Railway of Ireland. Each train unit will consist of an articulated two-coach unit, designed to be driven by a "Drumm" battery. There will be two 200-h.p. 500-V motors per train unit, with double and multiple unit electro-pneumatic control, arranged to give series-parallel operation with regenerative braking.

There has been a steady demand for rolling mill plant, excavators, pumps, paper-machine drives, wood grinders and electrical equipment for machine tools, while several developments have taken place in connection with the manufacture of fractional h.p. motors, a new range of repulsion-start single-phase induction motors of ¼, ⅓ and ½ h.p. having been placed on the market. Two additional motors for gramophones have also been designed.

Special talking-picture equipments for the smaller theatres, &c., have been developed, and a new sound reproducer for the projection of a 16 mm. sound and picture film has been designed for operation on 50-cycle a.c. supply.

Radio Trieste

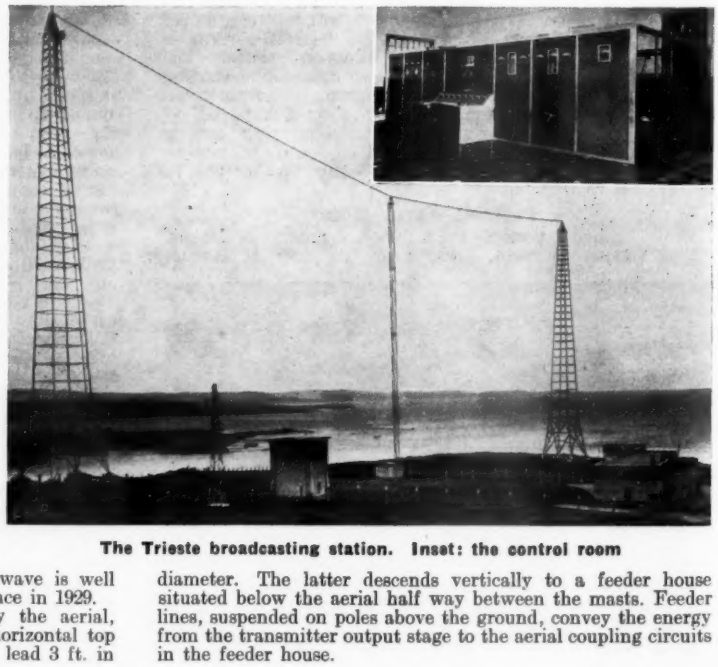
THE completion of the new Monte Radio broadcasting station in a suburb of Trieste, overlooking the Adriatic Sea, marked a further step in the reorganisation of the Italian service, undertaken by the E.I.A.R., which aims at serving not only the main industrial and artistic centres of the country with adequate programmes, but also the less densely populated countryside.

The plant was officially inaugurated on October 28th, and its programmes are heard at good strength and clarity well beyond the Italian borders.

The Trieste transmitter was manufactured at the Marconi works, Chelmsford. It is of the PA.14A type, embodying the principle of low-power modulation, the modulated energy being delivered through an intermediate amplifier to the last or power stage, and then to the aerial system; water-cooled valves are used in the main amplifying stages. The unmodulated energy is 10 kW; modulation up to 100 per cent. can take place, so that the C.C.I.R. rating amounts to 15 kW. The transmitter covers the wave band of 200 to 545 metres, but the working wave of the Trieste station is 247.7 metres (1,211 kc.).

A special crystal drive, fitted in a heat-insulated box, with thermostatic control, prevents variation of the transmitted frequency and ensures that the constancy of the carrier wave is well within the limits specified at the Hague Conference in 1929.

Two masts, each 80 metres in height, carry the aerial, which is of the "T" type with a single-wire horizontal top 20 metres in length and a three-wire cage down lead 3 ft. in diameter. The latter descends vertically to a feeder house situated below the aerial half way between the masts. Feeder lines, suspended on poles above the ground, convey the energy from the transmitter output stage to the aerial coupling circuits in the feeder house.



The Trieste broadcasting station. Inset: the control room

The Armstrong Oil-electric Railcar

Successful trials at Newcastle

TRIALS of a 250-b.h.p. oil-electric railcar were carried out recently on the Newcastle-Blackhill and Blackhill-Durham routes (gradients mainly 1 in 66) and on the Durham-Newcastle main line of the L.N.E.R. system under the supervision of Mr. H. N. Gresley, chief mechanical engineer. The normal timing from Newcastle to Blackhill is 45 minutes including eight station stops—a running time of 41 minutes—over which the railcar showed a saving of 7 min. 12 sec. On the homeward journey the railcar attained a maximum speed of 64 m.p.h.

The railcar is driven by one man and the master controller is fitted with the usual "dead man's handle." The driver selects one of the two engine speeds, and on moving the controller handle, the railcar accelerates and runs automatically at constant engine horse-power. The driver had had only three hours previous driving of the railcar. On a large number of occasions when coasting downhill, fuel was economised by shutting down the engine.

The engine is of the Armstrong-Sulzer locomotive type with six cylinders and four-stroke trunk pistons. The connecting rods are of chrome-nickel steel, the pistons of aluminium, and the renewable cylinder liners of forged steel. All moving parts are pressure lubricated by gear pump. Failure of lubricant or cooling water supply automatically closes down the engine. If a cylinder should go out of action, the governor automatically reduces the aggregate load. The fuel supply is regulated by a centrifugal governor, the setting of which determines at which of two speeds the engine shall run. Remote control of the fuel-pump shaft enables the driver to start or stop the engine, which is normally started electrically by motoring the generators from a battery under the floor at the middle of the railcar. The main generator is self ventilated and is partially decompounded. An auxiliary generator supplies current for excitation and control and for charging the battery. The two self-ventilated axle-suspended traction motors are mounted on the bogie at the engine end of the car; their control apparatus is mounted in a case under the car.

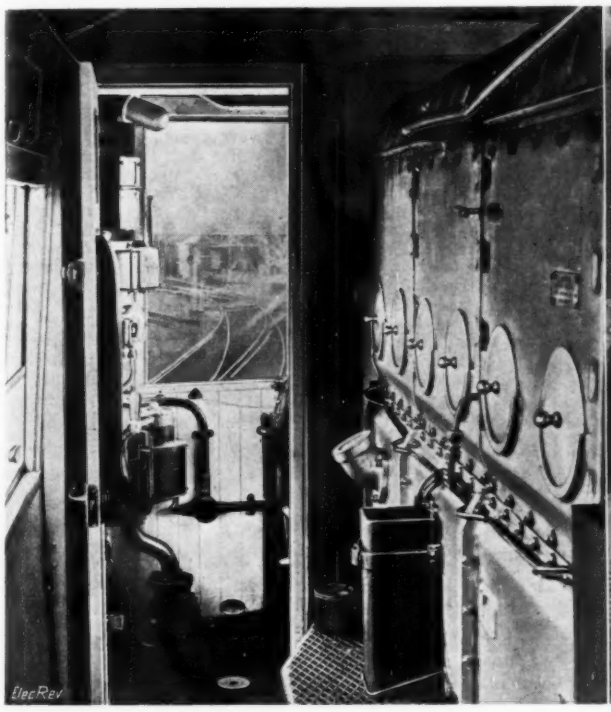
The generator control equipment, consisting of automatic field rheostat and instruments, is fixed in a cubicle in the engine room, the driver's cab containing only the apparatus essential for driving purposes, viz., master controller, engine starting buttons, brake valve, vacuum gauge, sanding pedal, whistle-operating lever, and lighting switches.

The engine-cooling water is circulated under thermostatic control through radiators mounted on the roof. While the engine is shut down at stations or when coasting, the water pump and also the rotary vacuum exhauster are driven from the battery.

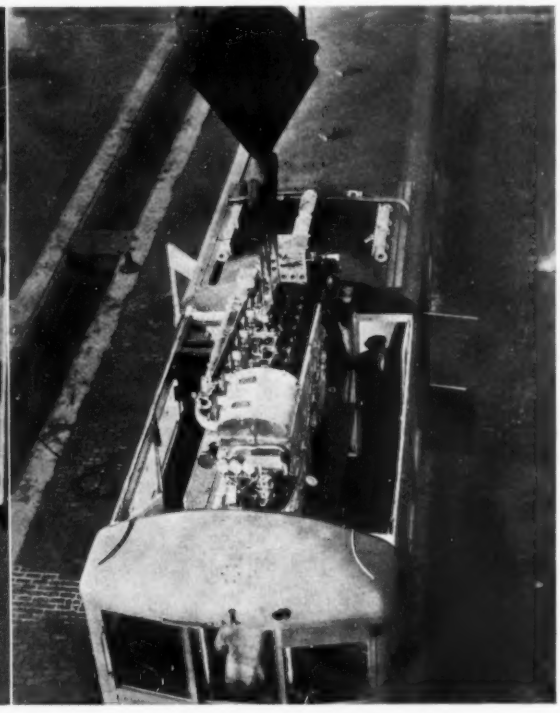
The railcar measures 60 ft. over headstocks. The seating capacity of the car is 60 and of the trailer 90. The weight in working order is 42 tons 10 cwt., and the starting tractive effort 6,600 lb. When hauling the bogie trailer with passengers weighing 27 tons, the balancing speeds (m.p.h.) are: on level, 50 to 55; grade 1 in 200, 41; grade 1 in 100, 30. For the car only, the m.p.h. are: on level, 56 to 60; grade 1 in 200, 48; grade 1 in 100, 41. Axle boxes are of the "Isothermos" type, which can be run for long periods without attention.

Underframe and bogies were constructed by Messrs. Armstrong Whitworth and the body was built on to the underframe by Craven's Railway Carriage and Wagon Co., Ltd. The vacuum brake equipment (including a Reavell rotary exhauster) is driven electrically.

The generator and auxiliary equipment were supplied by Laurence Scott & Electromotors, Ltd., and the motors and the electric control equipment by the General Electric Co., Ltd., both to Armstrong Whitworth's detailed specifications. Two further cars are on the point of completion.



The driver's cab



Lifting the engine after removal of roof

Track-switch Operation at Yallourn

IN a paper read a short time ago before the Institution of Engineers, Australia, Mr. J. M. Bridge described the methods of open-cut mining of brown coal at Yallourn, and made special mention of the electrical operation of the track switches in the railway system connected with the coalfield.

The apparatus is actuated either by electric switches operated manually or by track circuits, the control point being at any distance from the mechanism. The control switches are in circuit with two sets of relays which drive a ¼-h.p. electric motor forward and reverse, respectively. On the motor shaft is a worm which engages with teeth cut in the circular periphery of a quadrant. The quadrant has a pair of compression springs attached to it and the upper end of the lever which controls the blade of the switch is held between them. The lower end of this lever is attached to the pull rod which operates the blade of the switch. When the quadrant is driven so that it rotates, say, from right to left, the mechanical springs carry the switch operating lever with them and the power supply to the motor comes through a contact on the left side.

The relative positions of quadrant, lever, springs and electrical contacts remain the same until the motion of the lever is arrested; then the quadrant continues to revolve from right to left, compresses the springs on the right side of the lever and allows those on the left of it to expand. Before the mechanical spring on the right is fully compressed the power terminal on the left leaves the metal contact against which it is normally pressed and breaks the motor-supply circuit.

In normal operation the motor is not stopped until the blade of the railway switch is pressed against the stock rail, but in the event of there being an obstruction between the blade of the switch and the stock rail the mechanism is brought to rest without injuring any of the parts. Indicator lights show whether the points have operated correctly or not.

"Electricity is Good for You." By Brig.-Gen. R. F. Legge, C.B.E.

The supply industry's inadequate and unorganised propaganda

WORKING in connection with a number of supply companies operating in widely scattered rural areas of this country, two of which are situated in parts where some of the inhabitants do not even speak English, the lack of knowledge of the public concerning electricity in general is brought forcibly home to one.

Before these companies came into being in these areas, few of the inhabitants had the faintest conception of the divers uses of electricity in home, shop or factory. Even now, with the aid of intensive publicity their electrical education proves difficult, as there are yet many who are genuinely *afraid* of it, and, however hard it may be to believe, there exists that insular prejudice against what to them appears to be a new and mysterious form of energy which has made its adoption for purposes other than lighting no easy matter for our salesmen.

People who dislike being compulsorily educated will accept being gratuitously informed, and to-day the general public is sufficiently advanced to take an intelligent interest in what it buys and wants to know something about it as well. *Then why not tell the public?*

Think of the happy position in which the electrical industry finds itself. It is not trying to push down the throats of a gullible public a soothing syrup guaranteed to cure all ills; it has something to sell which has proved itself to be an inestimable boon to humanity. Is that sufficient reason to believe, in these enlightened times, that the old adage "Good wine needs no bush" still obtains? Unhappily there are many who think this is so.

The Engineer's Attitude

My experience has convinced me that there are still a number of people holding positions in supply undertakings who either do not appreciate the true value of skilful publicity or perhaps think that theirs is a sheltered industry that does not require it.

In other words the electrical engineer does not really believe he has a business needing for development just as much intensive propaganda as the firms who sell soap, gramophones or patent medicine; this is a little hard to understand, knowing that he is not restricted by professional etiquette. I suggest he should remember that he has a commercial commodity to sell and to market his goods economically and profitably he should adopt the progressive modern methods of other successful businesses.

The engineer's training accustoms him to rely continually upon statistics. Statistical departments work out normal increases in sales which they estimate must accrue even if the sales staff smoked their pipes all day and did nothing else as an aid to selling; it is to increase this normal increment that propaganda is needed. Such departments sometimes produce figures showing that x pounds representing the cost of sales publicity effort per additional consumer obtained or per unit sold is incommensurate with the profit of y pounds on the revenue obtained from this consumer or these units.

Although these statistics have their use, I regard them with the gravest suspicion; figures can prove either side of most cases according to the particular line of thought of the statistician. I admit, however, that it is not easy to key up results from publicity with actual expenditure over short periods.

Does Publicity Pay?

Hundreds of hoardings inform us that a certain beverage is good for us. Thousands of pounds are spent on giving us this gratuitous information. Is it wasted? From the sales results one would say not, such is the credibility of humanity excited by forceful suggestion!

One may ask why the gas industry should spend the vast sums on publicity which have done so much to make that industry a friendly rival worthy of our steel. The answer is that those responsible have come to the conclusion that propaganda pays and is the very breath of business life.

Of all Britishers the Scot, with his assumed characteristic of "closeness" which he seldom loses an opportunity to broadcast, must be the strongest believer in propaganda. What does this insinuate but that he is a good business man who gets the best value for his money? As a result he is welcomed in the best business posts. This may also be due to merit, but I contend that such seed sown lies fallow in the sub-conscious mind of the listener and germinates eventually to the Scotsman's advantage—more power to his elbow!

What is Done: What Might be Done

At present the general public is being electrically informed in two ways:—

(*a*) By a national effort.
(*b*) By individual efforts of progressive supply undertakings.

The British Electrical Development Association is responsible for the national effort. This body works under very difficult conditions; it essays to make shoes without leather but has not yet discovered a method of making such things out of paper. In other words it is inadequately supported financially by the supply undertakings and electrical manufacturers, which confirms my contention that there are still many who do not believe in publicity.

The Central Electricity Board has practically completed its transmission; it has spent a vast sum of public money and spent it well, and now it has to show results. Interest must be paid on the capital raised. *It has as much need to sell electricity as any supply undertaking.* Undoubtedly a commercial section will be required to deal with sales policy and publicity; it may decide respecting the latter to throw in its lot with E.D.A., or it may conclude that it is better to carry out this work itself. Again, I suggest co-operation means economy if skilfully directed.

With regard to the second point—individual local efforts—little enough publicity is carried out by the average supply company or municipal undertaking.

Co-operation of organised effort could be arranged effectively from within, by each section of the electricity supply industry. The power companies have already begun the good work under the auspices of the Incorporated Association of Electric Power Companies, and the municipal authorities might do well to get their Association to take similar steps.

Union is Strength

The effect of co-operative effort must certainly be far more widespread than individual work, even as the heavy blow of the big steam-hammer is more effective than the same amount of energy distributed by a number of taps. Further, such effort with no definite continuity is largely wasted; in other words, Napoleon's maxim "concentration of superior numbers at the decisive point during the critical moment" is as valuable in electrical publicity as in the strategy of war.

Campaigns in support of different sales efforts should be organised by undertakings all over the country at the same time and under similar general conditions. It is realised that every undertaking has its individual peculiarities of town or country—its varying tariffs and hire-purchase terms, necessitating special local publicity, but this is additional to that which may be termed the general propaganda of the supply undertakings themselves.

Without mentioning any particular make of refrigerator, cooker or kettle, general publicity can be adopted throughout the country during the correct season applicable to the sale of each appliance or to obtain new consumers with similar posters, leaflets, envelope stuffers, press matter and direct mailing, centrally designed, edited and printed with consequent economy. The cost of printing diminishes proportionately with the increase of quantity of similar matter ordered in far greater ratio even than the decrease in prices on increasing supplies of any particular apparatus.

What We Ought to Spend

What position does Great Britain hold in the list of countries as regards units sold per head of population? We are not even in the first six. What percentage of gross revenue do supply companies devote to general publicity? I am informed an average of about 1 per cent. What does America spend? Again I am informed about 2 per cent. Why should we spend less than the Americans? I suggest that such a percentage might be allocated as follows: half per cent. for national propaganda and one and a half per cent. for individual publicity. This would furnish E.D.A. or any such body with the funds required for the work for which it should be responsible.

To carry out national publicity worthy of the industry, which will give results of value commensurate with expenditure, the British Electrical Development Association needs an income of at least £200,000 per annum, *i.e.*, it should have at its disposal four or five times that which it now has. Anyone with any knowledge of publicity is aware that within wide limits the proportion of value obtained rises considerably as expenditure increases. To put it simply, a full page advertisement gets a higher proportion of result per £ of cost than that from 5 in. of double column.

After all, what is £200,000 spent on national publicity for an industry where the year's income of the authorised undertakers alone amounts to over £60,000,000? With a skilfully organised education of the public by means of intensive publicity, both national and individual, one could look forward to the day, not more than a decade hence, when everyone will have practically an unlimited amount of electricity on a rental or other basis, as with water supply, and we should be able to do away altogether with the meter-reading man and the switching off of lights at every moment, an obnoxious but common practice in these difficult times.

Someone has said that advertising is the mirrored reflection of commerce; this may be so, but to appeal effectively to the public at large such advertising must be carried out so simply and on so large a scale that he who runs may read.

E.T.B.I. Divining Disc Competition

As a result of the Divining Disc Competition held in connection with the Electrical Trades Benevolent Institution Ball at Newcastle-on-Tyne on November 27th, a sum of £80 (after deducting all expenses) has been handed over to the funds of the Institution.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The " Electrical Review " Index

The Index to Vol. CIX (for the half-year ended December 31st, 1931) is in course of preparation and will be published shortly. We shall be glad to receive the names and addresses of those who require it (free of charge) for binding purposes, or wish to retain it for reference. Application should be made as early as possible to the Publisher, 4, Ludgate Hill, E.C.4.

Radio Sales in Canada

Sales of radio receiving sets by authorised manufacturers and importers in Canada during the first six months of 1931 amounted to 75,745 sets, valued at $6,385,555, based on factory selling prices, according to a report by the Dominion Bureau of Statistics. These sales consisted of 68,395 a.c. mains sets valued at $5,410,914, 5,414 a.c. mains radio-gramophones ($861,000), and 1,936 battery-operated sets ($113,640). In the first six months of 1931 the radio branch of the Department of Marine at Ottawa issued 472,310 licences compared with 599,116 for the whole of 1930.—*Reuter's Trade Service.*

An All-electric Automatic Restaurant

The first London all-electric automatic restaurant—or " Buffeteria," as it is called—was opened recently at 70, Ludgate Hill, E.C. The exterior has a most neat and up-to-date appearance, and at night an ingenious lighting scheme around the doorways proves very effective. Inside, the Imperial Shopfitting Co., which was responsible for the design and decoration of the premises, has introduced a number of interesting features. On either side of the entrance hall is a

The exterior and kitchen of the new all-electric " Buffeteria "

row of automatic machines, from which all manner of dishes and drinks can be obtained. At the " quick-lunch " counter at the rear of the premises a thermostatically controlled water boiler and food warmer ensure that everything is served up hot. Electric drink mixers and waffle irons are also installed at this counter, where, incidentally, electrically heated foot warmers are provided. Downstairs an all-electric kitchen equipment includes a large water-heating installation, grillers, and a double oven having a total loading of 9 kW. The equipment of the kitchen and lunch counter, as well as of the automatic machines, was carried out by Messrs. Benham and Sons, Ltd.

American Radio Valve Law Suit

The *Electrical World* states that damages estimated at $9,000,000 are claimed in a suit brought in the United States District Court at Boston by Raytheon, Inc., formerly the Raytheon Manufacturing Company, against the Radio Corporation of America on the ground of alleged violation of the Sherman Act through the leasing of certain patents to competing companies. The plaintiff company asserts that its profits have greatly decreased as a result. The Raytheon Company has also filed a bill in equity in the Supreme Judicial Court of Massachusetts to restrain the Radio Corporation from terminating a licence granted to the plaintiff under which it claims authority to sell radio valves on a basis of 10 per cent. royalty and a minimum payment of $50,000 per year.

Tunnel Lighting in New Zealand

An interesting lighting installation has recently been completed in the new Mount Victoria Tunnel in Wellington, New Zealand. The tunnel, which is 2,045 ft. in length, cost £203,000. The lighting installation consists of 120 Benjamin " Rodalux " fittings which are specially spaced so that the eye on passing from broad daylight into darkness is gradually accustomed to the change.

Postponement of Australian Duties

The *Board of Trade Journal* states that the Commonwealth Government has announced that the operation of the deferred duties on certain goods which were to come into force on January 1st has been postponed to February 1st. These goods include valves for wireless telegraphy and telephony (tariff item 181 (A) (2)).

German Aluminium Price Reduction

The leading producer of aluminium in Germany (the Ver. Aluminium Werke) announces as a result of the Government emergency ordinance a reduction in the price to inland consumers of aluminium ingots from 170 to 160 marks per 100 kg., and from 174 to 164 marks in the case of rolled bars.

Change of Name

Messrs. Crane-Bennett, Ltd., have changed their title to " Crane, Ltd." The new telegraphic address is " Cranelon Phone " at London, Ipswich and all branches. The management and policy of the company remain unaltered.

Malayan Electrical Imports

Imports of electrical goods and apparatus into Malaya during the first three quarters of 1931 represented a total value of £423,810, as compared with £489,284 during the corresponding period of 1930.

Steel Furniture and Equipment

Messrs. G. A. Harvey & Co. (London), Ltd., draw our attention to the extraordinary development in the use of steel in the construction, equipment and furnishing of buildings during recent years. They state that they have supplied steel doors, partitions and office furniture for many large buildings, both at home and abroad. The saving of space and the fire-proof qualities are the features which make the biggest appeal to purchasers of steel equipment.

Transport Workers' Wages

The Underground Group of companies announces that it has asked the trade unions representing the majority of the employés of the Underground railways, the L.G.O.C., and the tramway companies in the group to discuss with them a temporary revision of the existing wage arrangements in order to meet the situation created by falling traffics. The Group states that substantial economies in operation have already been made without interfering with salaries and wages, but it is felt that the time has arrived when some more substantial and effective proposal is necessary. Notice to terminate all existing wage agreements has been given. The companies do not seek any permanent revision of these agreements, and they hope that it will not be found necessary to continue the adjustments which they now propose for any prolonged period.

It is reported that the employers' side of the Joint Industrial Council for the Tramway Industry has given formal notice to terminate the wages agreement with the employés, and negotiations will open shortly.

Polish Tariff Measures

A *Reuter* message from Warsaw states that under the new Polish tariff British exporters are affected in respect of a number of articles. The imports of certain goods are entirely prohibited, while to a lesser degree Great Britain may be affected under such categories as apparel, footwear, textiles and electrical machinery and apparatus. The tariff increases include radio apparatus and parts, the duty on which has been raised from 1,500 to 4,000 zloty per 100 kg.

New Electrical Accessories Factory

Messrs. Harwell, Ltd., Sessions House, Clerkenwell Green, E.C.1 (agents for various Continental manufacturers of electrical goods), inform us that in conjunction with Paul Hochkopper & Co., Ludenscheid, they have just registered a company under the title of "P. H. British Electrical Works, Ltd.," and have a factory in course of construction in West Norwood, where in future "P. H." electrical accessories will be manufactured.

Social Events

The annual staff dinner of the Lothians Electric Power Co., was held on December 30th, when Mr. H. C. Babb, general manager, in a brief speech dealt with the recent development of electricity supply in the company's area. He said that during the last few years they had spent nearly half a million on the erection of distributing lines and cables in East Lothian and Mid-Lothian and adjacent counties, so that now electricity was available in an area of 700 sq. miles. About 4,500 consumers had availed themselves of the service. There was a great unexplored field for the use of electricity on the land for ploughing and other farming uses. The East Lothian County Council was using electricity completely for the heating of the new county buildings in Haddington.

Over 100 persons, including the chief members of the staff, and representatives of electrical manufacturers attended the recent annual staff dinner of the Chester Corporation Electricity Department. Mr. S. E. Britton said that sales from the Corporation electrical showrooms had never been so great as to-day. Every section of the community was looking to electricity to help it out. Generous use was being made of electrical energy to assist in farm operations in Cheshire. During the evening a presentation was made to Mr. Harry Minshull, who was associated with the Chester electricity undertaking when it was inaugurated by Mr. Thomas Parker, of Wolverhampton, in 1896.

The Simplex Conduits Christmas party took place at Birmingham on December 23rd. The proceedings opened with dinner, when Mr. F. Bagley, in toasting "The Management," referred to the spirit of goodwill and courtesy which had always characterised their relations with the staff, and Mr. John Huntington responded. Mr. A. J. Spiller proposed "The Social Committee," Mr. A. K. Spencer replying. Mr. H. F. McLoughlin also spoke. The rest of the evening was occupied by dancing and other forms of revelry, among which was a farce, "Night in a Haunted Kirk."

A Christmas party was held on December 22nd by the Cable Department staff of Johnson & Phillips, Ltd. There was an attendance of about 120, and the evening was devoted to dances, games, and competitions. Prizes for successful competitors and Christmas gifts for all present were distributed from a Christmas tree. The presents were provided by the directors and branch managers of the firm. Throughout the evening music was provided by J. & P. reproducing apparatus.

On December 31st the staff sports club of the Leatherhead and District Electricity Supply held its New Year's Eve carnival dance at the New Bull Hotel Restaurant, Leatherhead. A company of over 100 enjoyed a programme of dancing and competitions under the direction of Mr. F. W. Ferrari. Fancy dress added to the enjoyment, and towards the end of the programme Mr. G. W. F. Horner presented the prizes to the successful competitors.

A Serviceable Display Board

To assist customers in the sale of Bakelite electrical accessories, Messrs. Thomas A. Rose & Son, Ltd., 25, Milton Street, E.C., are issuing novel display boards, bearing the inscription "Is It Here?" Upon each board are mounted thirty "Rosomil" Bakelite electrical accessories, among them being tumbler switches, lampholders, connectors, bell pushes, plugs and sockets, &c. There is such an extensive range of accessories of this kind that buyers experience difficulty in describing them. These boards, therefore, should be of assistance to them. The company's catalogue numbers are placed below the articles, which can be easily detached from the board.

British Diesels for Russia

Technical experts, representing the Russian Government, recently visited the works of a number of British and Continental oil engine makers with a view to examining Diesel engines for the equipment of new fishing vessels, and as a result of their visits an order has been placed with Messrs. Ruston & Hornsby, Ltd., for about 100 vertical oil engines.

A Window Display Exhibition

An exhibition of window displays is now being given by Display Craft, Ltd., at 68, York Road, S.E.1. Demonstrations may be seen of the "Selectasine" method of producing multiple displays.

Electric Vehicles in Italy

With the title of the Società Esercizio Veicoli Elettrici, a concern has lately been formed in Milan (404, Via Padova) to develop the use of electric commercial and public-utility vehicles in Italy. The new company will interest itself largely in the electric vehicles which are now being manufactured by the Fiat Co., of Turin, in conjunction with the Italian General Electric Co., and are being fitted with a battery known as the "Catanodo," which is supplied by the Società Magneti Marelli. A fleet of 60 of the new vehicles has been acquired by the Società Servizi Publica Anonima Italiana, which holds the contract for the street cleaning and house dust-collection work in Milan.

New French Companies

Among the concerns recently organised in France are the Société des Industries Electro-Téléphoniques (S.I.E.T.), Paris (36, Avenue Hoche), capital one million francs, to manufacture and install telephonic apparatus; the Compagnie Electro-Automatique, Paris (8, Cour des Petites Ecuries); La Société l'Omnium Téléphonique, Paris (19, Rue Lafayette), to manufacture telephone and telegraph apparatus; and La Société d'Etudes de la France de Morzine, Paris (18, Rue de Madrid), to prepare plans for the establishment of a hydro-electric power station to utilise certain waterfalls in the Upper Savoy Department.

Turkish Import Restrictions

The *Board of Trade Journal* reports that the system introduced in November for the restriction of imports of various goods into Turkey has been somewhat modified by a Decree of December 9th. Under this certain classes of goods are exempt from the quota system, including fixed or semi-fixed steam engines or turbines, "electric engines" (electric motors), dynamos (a.c. and d.c.), transformers, commutators, resistances, coils, magnetos, sparking plugs, convertors, distributors, ventilators, vacuum cleaners and the like (mounted or not), and parts of these machines.

Prices Not Raised

Woodfyt Sales, Ltd., of 10a, Newman Street, London, W., wishes to correct an impression that has got abroad that its prices have been increased. It is anticipated that increased demand for British products under the protective duties will enable prices to be stabilised even if the cost of materials is raised.

For Sale

East Ham Corporation has a quantity of electrical plant for sale.

Southend-on-Sea offer three steam engines for sale.

(See our advertisement pages to-day.)

Patent Amendment

Messrs. J. H. Tucker & Co., Ltd., and Mr. J. B. Tucker are applying for permission to amend the specification of letters patent No. 282,551, granted to them and Mr. T. R. Martin for an invention entitled "Improvements in or connected with electric lamp holders or sockets." (See our advertisement pages to-day.)

Trade Announcements

Mr. Charles Lozek has removed to new premises at Fearon House, 39, Holborn Viaduct, E.C. His telephone number is now Chancery 7510.

New premises at 4-8, Thomas Street, Liverpool, which include large showrooms and stockrooms, have been acquired by Messrs. T. Beadle & Co., Ltd., electrical and radio factors, who have closed down their old store at 43, Thomas Street.

Messrs. J. H. Tucker & Co., Ltd., have opened a depôt at 11, Park Lane, Cardiff (telephone, Cardiff 4235), where stocks of electrical accessories, tumbler switches and ironclad main switchgear will be carried. Mr. A. Smith, the company's agent for South Wales, will be in charge of the depôt.

The contract drawing offices of Messrs. Babcock & Wilcox, Ltd., which have hitherto been situated in the London office, have been transferred, as from January 1st, to the company's Renfrew works. The Designing Department will remain in London.

Recent Contracts

Messrs. Blackstone & Co., Ltd., have received a contract for the supply and erection of the whole of the machinery required for pumping crude-sewage and storm water at the Sneinton Pumping Station, City of Nottingham Drainage. This contract provides for the supply of four 8-in., and two 12-in. Blackstone "Unchokeable" crude-sewage pumps, together with a 3-in. general purpose pump. The pumps will be electrically driven by vertical slip-ring motors, and controlled by float-operated automatic switchgear. These, and the supply of the necessary pipes, valves, &c., are also included.

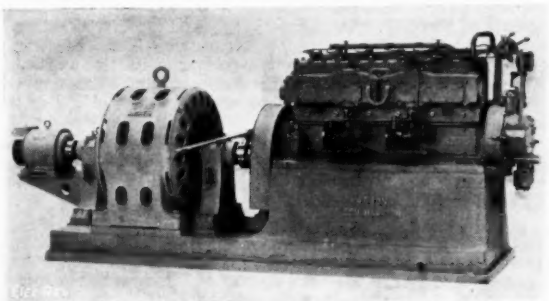
Siemens Electric Lamps and Supplies, Ltd., has received a contract from the Warrington Corporation Public Health Department for a supply of gasfilled lamps for six months. The company has also received a further order from the Union-Castle Mail Steamship Co., Ltd., for six months' supply of vacuum and gasfilled lamps.

The Swansea Borough Council has accepted the tender of Messrs. Pauling & Co., Ltd., London, at £353,853, for carrying out engineering works, including intake and discharge tunnels 300 ft. deep, for conveying condensing water from Queen's Dock, in connection with the Swansea power station scheme. Under the terms laid down by the Unemployment Grants Committee, the work was put in hand on January 1st.

The British Thomson-Houston Co., Ltd., has received orders from the Union Castle Mail Steamship Co. for a supply of vacuum and gasfilled lamps for the six months ending June, 1932, and from the Admiralty for a supply of "Mazda" lamps.

The British Thomson-Houston Co., Ltd., has also obtained an order from the London, Midland & Scottish Railway Co., for six rotary convertors, with starting panels and transformers, required in connection with the increased traffic on the Euston to Watford line. Each of the new machines will be rated at 1,500 kW, 630 V, 25 cycles, 500 r.p.m., and one unit will be installed in each of the sub-stations at Camden, Bushey, Stonebridge Park, Dalston, Willesden, and West End Lane.

We reproduce below a picture of a standard "M6S" 100-h.p. engine, made by the Parsons Oil Engine Co., Ltd., with alternator set by the Electric Construction Co., which is being supplied to the Rangiora (N.Z.) Borough Council by the E.C. Co., through its New Zealand agents. It is a typical plant of up-to-date design, which while being primarily of a standby character and using petrol, can be run to full capacity for as long as



A Parsons 100-h.p. alternator set

required, in the same way as any oil engine. The purchasers in this case specified a clutch between the engine and the alternator. The plant runs at 1,500 r.p.m., the standard output being 37½ kW, but the engine is capable of an output up to 66 kW if required. Both water-circulating pump and oil pump are of the plunger type, the former being double acting. The ignition is by magneto with impulse starter, and the engine is started quite easily in the ordinary way by hand.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, Etc.	Price Jan. 6th.	Fortnight's Inc. or Dec.
a Acid, Oxalic .. .. per lb.	5½d.	—
a Ammoniac, Sal .. .. .. per ton	£60	—
a Ammonia, Muriate (large crystal) .. ,,	£52	—
a Borax .. .. ,,	£17	—
a Copper Sulphate .. .. .. ,,	£25 10s.	—
a Potash, Chlorate .. .. .. per lb.	3d. to 4d.	—
a ,, Perchlorate .. .. .. ,,	5½d.	—
a Shellac T.N. .. .. per cwt.	£4 5s.	—
a Sulphur Commercial .. .. .. ,,	£11	—
a ,, Roll .. .. ,,	£11	—
a Soda, Chlorate .. .. per lb.	3d.	—
a ,, Crystals .. .. .. per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks .. .. per lb.	4d.	½d. inc.
METALS, Etc.		
b Aluminium, Ingots .. .. .. per ton	£95 to £100	—
b ,, Wire .. .. .. per lb.	1/1 to 1/9	—
b ,, Sheet and Foil .. .. ,,	1/1½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I .. .. .. per ton net	£130	£4 dec.
Grade II .. .. ,,	£93	£3 dec.
Grade III .. .. ,,	£53	£1 dec.
c Brass (rolled metal 2" to 12" basis) .. per lb.	8d.	—
c ,, Tubes (solid drawn) .. .. ,,	10d. to 10½d.	—
c ,, Wire, basis .. .. .. ,,	8½d.	—
c Copper Tubes (solid drawn) .. .. ,,	11½d.	½d. inc.
c ,, Bars (best selected) .. .. per ton	£77	£2 inc.
c ,, Sheet .. .. ,,	£77	
c ,, Rod .. .. ,,	£77	
d ,, (Electrolytic) Bars .. .. ,,	nom.	—
d ,, ,, Sheets .. .. ,,	nom.	—
d ,, ,, Wire Rods .. ,,	nom.	—
d ,, ,, H.C. Wire .. per lb.	7¾d.	—
f Ebonite Rod .. .. ,,	1/3 to 1/6	—
,, Sheet .. .. ,,	1/3 to 1/6	—
m German Silver Wire .. .. .. ,,	2/2	—
h Gutta-percha, fine .. .. .. ,,	nom.	—
h India-rubber, Para fine .. .. ,,	4½d.	—
i Iron, Pig (Cleveland No. 3) .. .. per ton	58/6	—
,, Wire, galve. No. 1, P.O. qual. ,,	£20	—
g Lead, English pig .. .. .. ,,	£16 10s.	5s. dec.
g Mercury .. .. per bot.	£19 to £19 10s.	£1–£1 10 dec.
e Mica (in original cases) small .. per lb.	6d. to 3/6	—
e ,, ,, medium .. ,,	4/– to 8/–	—
e ,, ,, large .. ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings .. ,,	1/1½d.	—
p ,, ,, drawn bars & rods ,,	1/1½d.	—
p ,, ,, rolled strip & sheet ,,	1/–	—
p ,, ,, wire .. .. ,,	1/1½d.	—
o Platinum .. .. .. per oz.	£11 6s.	—
d Silicium Bronze Wire .. .. .. per lb.	9d.	—
r Steel, magnet, in bars .. .. ,,	7½d.	—
g Tin, Block (English) .. .. .. per ton	£138 15s. to £140 15s.	£4 dec.
n ,, Wire, Nos. 1 to 16 .. .. per lb.	3/1	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
m P. Ormiston & Sons.
o Johnson, Matthey & Co.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

An Appliance Manufacturing Development

Mr. S. Schneider, 3, Hanover Court, Moor Lane, E.C.2, has registered the British Electric Domestic Appliances, Ltd. (as announced in the ELECTRICAL REVIEW, December 25th, p. 972), which will almost immediately take over his business in connection with the "Mary Ann" electric vacuum cleaner, "Bedal" (formed from the initial letters of the new company) irons, fires, hair dryers, electric kettles, &c. It has been arranged that all of these products, which have hitherto been made on the Continent, will now be made at well-known electrical factories in this country, with British capital, labour, and so on; the "Mary Ann" cleaner will be produced at Acton. Notwithstanding the gold standard position and the import tariff the company expects to retail its British-made goods at the same prices as have been charged for the Continental.

Calendars and Diaries

Two excellent wall calendars have been received from the Lytham-St. Anne's Electricity Department. One entitled "Morning Calm" depicts a seascape, while "George"—an amusing puppy—brightens the second.

A diary of Messrs. Daniel Doncaster & Sons, Ltd., has large weekly sheets with quotations and proverbs on each.

Pope's Electric Lamp Co., Ltd., has sent us a serviceable wall calendar with extra large monthly sheets.

Views of the company's workshops illustrate the calendar of Messrs. Robert Craig & Sons (Engineers), Ltd. It has bold daily slips.

The January-February diary of the Feed Water Specialists Co. contains a number of useful tables and particulars relating to feed water consumption, thickness of pipes, rate of flow of water, &c.

A handy pocket diary has been received from Mr. George Barnard, 1, Nile Street, Birmingham.

As usual, the Liverpool Electric Cable Co.'s calendar bears a picture of the Mersey, the training ship *Conway* being this year's subject.

Clearly printed tear-off monthly slips are provided on the calendar of Brittain's Electric Motor Co.

Messrs. Barrett, Tagant & Gotts have sent us a neat calendar with large daily sheets.

New Catalogues and Lists

George Ellison, Ltd., Perry Barr, Birmingham.—A pamphlet on overload protection of electric motors.

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C..4.—Publication Nos. 6746 and 6747, relating respectively to permanent magnet moving coil loud-speakers and radio components generally.

Robert Craig & Sons (Engineers), Ltd., Great George's Street, Belfast.—A number of publications illustrating and describing water turbines, pumps, air compressors, and other machinery produced by the company.

Hamworthy Engineering Co., Ltd., Poole, Dorset.—A leaflet relating to air compressors.

Feed Water Specialists Co., St. Paul's Square, Liverpool.—Technical publication No. 41, containing some interesting facts about salts in boiler feed water.

Carron Company, Falkirk.—No. 8 of the "Famous Men and Carron Works" booklets refers to W. and H. Haworth.

Brook Motors, Ltd., Empress Works, Huddersfield.—An abridged stock list (No. 320) of small- and medium-sized a.c. motors.

Kenneth Brooks (Radio & Television), Ltd., 72-86, Oxford Street, W.1.—A striking broadsheet relating to the new "Zetavox" radio receivers.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds.—January list of surplus new and second-hand electrical material.

Increased Use of Traffic Signals

The increasing popularity of traffic signals is very evident from the number of installations now being carried out in all parts of the country. The Revo Electric Co., Ltd., has supplied apparatus to more than thirty different towns and cities. In our illustration we show how Revo signals have

Revo signals at Wolverhampton

been fitted to an existing lighting standard in the centre of Princess Square, Wolverhampton. The apparatus comprises four one-way signals with 12-in. lenses mounted on special brackets, the control panel being fixed beneath the signals. Two other junctions in Wolverhampton are controlled by Revo signals.

Bankruptcy Proceedings

A. W. Creasey (trading as the Essex Electrical Storage Co.), Foundry House, Hall Lane, Walton-on-the-Naze.—The statutory first meeting of creditors was held on December 30th at the London Bankruptcy Buildings. The debtor has lodged a statement of affairs showing total liabilities of £1,834 (ranking £561) and assets expected to produce £821, after deducting £17 representing payment of the preferential claims. The debtor does not admit that he is insolvent, and attributes his financial difficulties to insufficient trade, no net profit having been made during the past three years. A resolution was passed for Mr. R. A. Rodgers, Coventry House, South Place, E.C., to act as trustee and administer the estate in bankruptcy, assisted by the following committee of inspection: Mr. A. C. Caldwell, Mr. D. R. Sleap, and Mr. G. S. Coop.

E. Marsden, electrical engineer, 51, High Holme Road, Louth, Lincs.—First meeting, January 8th, at the Official Receiver's office, St. Mary's Chambers, Great Grimsby. Public examination, February 4th, at the Town Hall, Great Grimsby.

D. L. Gibson (James Rush & Co.), radio dealer, 31-33, Westgate Road, Newcastle-upon-Tyne.—First meeting, January 8th, at the Official Receiver's office, 81, St. Mary's Place, Newcastle-upon-Tyne. Public examination, January 27th, at the Court House, 56, Westgate Road, Newcastle-upon-Tyne.

H. Nutter, electrical engineer, 246, Yorkshire Street, Rochdale.—Supplemental dividend of 6s. 0½d. in the £, payable January 11th at the Official Receiver's offices, Byrom Street, Manchester.

Company Liquidations

Halcyon Wireless Co., Ltd., 27a, Pembridge Villas, Notting Hill Gate, W., and at Birmingham and Leeds.—The statutory first meetings of the creditors and shareholders of this company were held on January 1st at the London Bankruptcy Court. Mr. G. Digby Pepys, Senior Official Receiver, reported that the order to wind up the company was made on November 23rd, 1931, upon the petition of creditors. The company was incorporated on October 23rd, 1923, under the name of Halcyon Wireless Supply, Ltd., the present title being adopted in August, 1927. The nominal capital of £2,000 was increased to £5,000 in June, 1930, and the issued capital was £4,450. Early in 1930 negotiations were opened for procuring additional capital, a petition having been presented by creditors for a compulsory winding-up order against the company. A committee of creditors was appointed to act in conjunction with Mr. B. A. Emby (managing director), with the result that the creditors accepted a composition of 5s. in the £ in satisfaction of their claims, and the petition was dismissed. At October 31st, 1931, there was a sum of £5,438 due to the bank, and the directors had advanced money from time to time totalling £7,153. The company exhibited at the 1931 Radio Exhibition and obtained orders amounting approximately to £19,000, as well as a foreign order to supply one hundred sets per week for one year, but owing to lack of capital those orders could not be carried out. It was in consequence of the good reports concerning the sets that the bank refrained from appointing a receiver although advised to do so. Further efforts were made to reconstruct the company, but without success, and on November 20th, 1931, the bank appointed Mr. F. E. Bendall, Midland Chambers, Warwick Passage, Corporation Street, Birmingham, as receiver. No statement of affairs had yet been filed, but according to draft accounts and balance sheets the position at October 31st, 1931, was that there was a total indebtedness of £19,896. The assets were valued by the directors at £6,595, but the receiver was of opinion that they would not realise sufficient to discharge the bank's claim. The failure was attributed chiefly to insufficiency of capital to meet very heavy overhead expenses during the delays caused by difficulties experienced in perfecting the designs for commercially satisfactory receivers. The liquidation was left in the hands of the Official Receiver.

Associated Electricity and Monoxide Gas Corporation, Ltd., 47, Victoria Street, S.W., and 3, Beavor Lane, Hammersmith, W.—At the statutory meeting of the creditors of this company a statement of affairs was submitted which showed total liabilities of £9,383. The plant and machinery, according to the books, amounted to £9,768, but a distress had been levied by the landlord for arrears of rent. The goodwill, patents, &c., appeared in the books at £73,873. The company commenced business about three years ago and took up research work in connection with the production of certain gas. The issued capital at the time was £83,922. The purchase of all the patents had not been completed. The shareholders had already passed resolutions for voluntary liquidation, with Mr. F. F. Sharles, of Salisbury House, E.C., as liquidator, and the creditors decided to confirm the appointment of the shareholders' nominee.

Mold Accumulators, Ltd.—Meetings, February 2nd at 1, Bank Street, Wrexham, to receive an account of the winding-up by the liquidator, Mr. J. Davis.

Marler & Co., Ltd.—Meeting, February 9th, at Barclays Bank Chambers, Commercial Street, Newport, Mon., to receive an account of the winding-up by the liquidator, Mr. J. D. R. Jones.

Private Arrangements

E. A. Newall (trading as E. A. Newall & Co.), electrical engineer, 64, High Street, Bognor Regis, Sussex.—A meeting of creditors was held on December 29th at the offices of Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton. A statement of affairs which was presented showed liabilities of £1,186 and net assets of £366, leaving a deficiency of £820. A resolution was passed in favour of a deed of assignment being executed to Mr. Orbell, whilst a committee was also appointed. The following are creditors:—

	£		£
Ellis & Mort	172	Siemens Electric Lamps & Supplies, Ltd. ...	75
Hands & Son	40	Cohen, M.	60
Shaw, J., & Co.	53	Leacey, Miss V. W. ...	250
Baxter & Caunter, Ltd.	102	Mulvey, B. H.	47

Electricity Supply

Lighting, Domestic, Power

Australia.—BRISBANE.—The City Council has decided to spend £22,500 on electrical extensions.

Barnstaple.—LOANS.—The Town Council has applied for sanction to loans of £13,500 for the installation of two 300-kW Diesel engines, with d.c. generators, and the removal of two old steam sets; £1,200 for laying a d.c. feeder from the power station to Coney Bridge; and £2,800 for extensions to the distributing system, services, and meters.

Beccles.—PUBLIC LIGHTING.—The Town Council has invited the East Anglian Electric Supply Co., Ltd., to tender for public lighting as from September 1st next for alternative periods of three or seven years.

Bolton.—FREQUENCY-CONTROL APPARATUS.—The Electricity Committee has decided to purchase frequency-control apparatus for the Back-o'-th'-Bank generating station. Among the reasons for this is to facilitate the use of electric clocks in the area.

Boston.—WIRING OF COUNCIL HOUSES.—The Rural District Council has given permission to the Boston and District Electric Supply Co., Ltd., to wire Council houses at Swineshead and Bicker for electric lighting.

Bournemouth.—PUBLIC APPROVAL OF ELECTRICITY BILL.—The decision of the Bournemouth, Poole, and Christchurch Town Councils, and the Christchurch Rural District Council, to promote a Bill in the next session of Parliament relating to the future supply of electricity in the district was approved at public meetings held recently in the district concerned. Under the local authorities' new agreement with the Bournemouth and Poole Electricity Supply Co., Ltd., provision is made for the extension of the lease to the company of the supply powers which expired in 1932 until 1942, the authorities reserving the right to take over the undertaking in 1942 if considered advisable. The company has already reduced its charges.

Burnley.—ELECTRICAL DEVELOPMENT.—Despite acute depression, the number of consumers connected during the first eight months of the current financial year increased from 11,578 to 12,592, while the total kWh generated during the period exceeded those of 1930 by 2½ per cent., despite a decrease of 192,421 kWh in the energy consumed for traction purposes.

Chesterfield.—COUNCIL APPROVES SPECIAL ORDER.—The Rural District Council has given its approval to a Special Order applied for by the Derbyshire and Nottinghamshire Electric Power Co. for the supply of electricity in the Council's area, and also in the Blackwell rural district and the Clay Cross urban area.

Continental.—ITALY.—According to *L'Energia Elettrica*, the capacity of the electric power stations in Italy at the end of October last amounted to 4,444,000 kW, as compared with 4,237,000 kW at the corresponding date of 1930. Of the total, hydro-electric plants represented 3,650,000 kW and steam and internal-combustion engine stations 794,000 kW. The output of electricity in Italy during the ten months ended October last is estimated at 8,309,356,000 kWh, as compared with 8,569,654,000 kWh in the corresponding period of 1930.

SWITZERLAND.—The Motor Columbus Co. of Baden is interested in a scheme for the erection of an electric power transmission line across the St. Gothard mountain to transmit surplus electrical energy from Italian Switzerland to the northern part of the country.

HUNGARY.—*The Times* states that the Power Securities Corporation has offered the Hungarian Government a loan of 65,000,000 pengos for electrification purposes.

Doncaster.—OVERHEAD LINES.—The Rural District Council is to offer no objection to the use of overhead lines for a supply of electricity to Sprotborough by the Electrical Distribution of Yorkshire, Ltd.

Elgin.—STREET LIGHTING.—The Town Council has decided to substitute overhead electric lamps for gas lamps in South Street.

Houghton-le-Spring (Durham).—SUPPLY TO SILKSWORTH HOUSES.—At a recent meeting of the Rural District Council it was reported that the Houghton-le-Spring and District Electric Lighting Co., Ltd., was willing to supply electricity to Council houses at Silksworth in place of gas, provided that the Council wired the houses. It was stated that many of the houses were already wired, and the cost of wiring the remainder would be £300. The Council decided to refer the matter to the Silksworth Parish Council, which had asked for electricity to be supplied to the houses.

Hull.—CABLE-LAYING.—At a recent meeting of the Electricity Committee the engineer reported that the contract for the supply and laying of cable would shortly expire and he suggested that the work of laying the cable could be done more economically by the Department. He was asked to report fully on the matter.

HIRING AND ASSISTED WIRING.—Under the cooker-hiring scheme, which has now been in operation for slightly over two years, the number of cookers installed has passed the 4,000 mark. The total number of installations carried out under the assisted-wiring scheme instituted nearly three years ago is over 10,000.

EXTENSIONS.—Sanction has been received to a loan of £17,000 in connection with the supply to the added area.

Inverness.—BULK SUPPLY.—The Town Council is negotiating with the Electricity Commissioners for a bulk supply of electricity.

Keighley.—SUPPLY TO SANATORIUM AND HOSPITALS.—The Electricity Committee has asked the engineer to submit alternative proposals for the supply of electricity to the sanatorium and hospitals.

Kirkcudbright.—ELECTRICITY SCHEME.—At a recent meeting of the Town Council it was reported that a committee, along with Mr. H. A. McGuffin, Glasgow, acting as adviser to the Council, had conferred with the County Council regarding the electricity scheme for the County. It was explained that the County Council had met since the report was drawn up and had agreed to become the distributor of electricity itself. It is expected that a supply of electricity will be available for Kirkcudbright within a year.

Leatherhead.—REDUCED CHARGES.—The charge for electricity for lighting has been reduced from 7½d. to 6d. per kWh. The two-part tariff has also been modified.

Lincoln.—ELECTRICITY CHARGES NOT TO BE RAISED.—The Electricity Department has decided to withdraw a circular issued recently to consumers which announced an increase of charges in certain instances. For the time being, the charges will remain unchanged.

Littleborough (Manchester).—MAINS AND SERVICES.—It is intended to provide new mains and services, mainly for street lighting purposes, at a cost of £2,000.

Llandrindod Wells.—BULK SUPPLY.—The Urban District Council has entered into an agreement with the Shropshire, Worcestershire and Staffordshire Electric Power Co. for a partial bulk supply of electricity.

London.—CHEAPER ELECTRICITY.—The London and Home Counties Joint Electricity Authority has authorised its Local Distribution Committee to prepare a scheme for the unification and reduction of tariffs, involving an aggregate reduction of prices amounting to an annual sum of not more than £25,000. A joint advisory committee of the Authority and certain companies coming within the operations of the London Electricity (No. 2) Act, 1925, is to discuss questions in connection with standard prices.

Manchester.—STREET LIGHTING.—The Electricity Committee reports that the opportunity presents itself for securing considerable street lighting business on satisfactory terms from the local authorities of Droylsden and Audenshaw on the basis of annual inclusive charges for electricity and the provision and maintenance of lamps, &c. A capital expenditure of £3,500 is therefore recommended for this purpose.

LOAN.—Application is to be made for sanction to a loan of £355,000 for sub-stations, mains and services.

New Hartley (Northumberland).—ELECTRIFICATION OF COLLIERY.—The Hartley Main Collieries, Ltd., are to electrify the whole of the plant at the New Hartley Hastings pit.

Newport (Salop).—SUPPLY TO NEIGHBOURING VILLAGES.—The Rural District Council has been informed by the West Midlands Joint Electricity Authority that a supply of electricity will be provided as early as possible to the villages of Chetwynd, Pickstock, Sambrook, Howle, Tibberton, Cherrington, Adney, Edgmond, Donnington, Lilleshall, Woodcote, Chetwynd Aston, and Sheriffhales. The work will cost nearly £30,000, and if the Authority is reasonably successful with wayleaves it should be possible to commence the work early in March.

New Zealand.—OPERATION OF ELECTRICITY UNDERTAKINGS IN 1930-31.—Particulars of the operation of the hydro-electric systems in the country during the past financial year are given in a recent issue of the *New Zealand Engineer and Radio*. The net revenue from the Horahora-Arapuni scheme, £82,704, was not sufficient to cover interest and depreciation charges, the year's operations resulting in a deficit of £35,694. This scheme has now a depreciation fund of £186,405 and a sinking fund of £56,740. The Waikaremoana-Mangahao system showed a gross profit of £223,541, which covered interest on capital and allowed a payment of £63,850 to the depreciation fund, which now stands at £284,966. In spite of restrictions in the use of power from Lake Coleridge, that scheme earned £160,599, and, after the payment of interest, £13,290 was paid to the depreciation account, £17,126 to the sinking fund, and £52,957 to the reserve fund. These figures would undoubtedly have been much better had the stand-by plant at Lyttelton been erected at an earlier date.

Northallerton (Yorkshire).—ELECTRICITY FOR ROMANBY.—The Cleveland and Durham County Electric Power Co. has submitted plans to the Rural District Council in connection with the Romanby electricity extensions.

Northern Ireland.—POSSIBILITIES OF LINKING-UP WITH FREE STATE.—The Belfast correspondent of the *Irish Times* (Dublin), in reviewing the progress made by the Electricity Supply Board of Northern Ireland in the reorganisation of the system, suggests that in the future the Ulster supply and the Shannon scheme will be linked up in the vicinity of Newry. Electricity would then be exchanged upon a mutually advantageous basis —that is, the North would supply electricity to the South in the summer months, and the Shannon scheme would strengthen the Northern supply in the winter months during the peak load.

Nottingham.—ELECTRICITY DEPARTMENT'S PROGRESS.—A two-part tariff was introduced in Nottingham in October. Within a month 1,500 applications were received for supplies under the scheme. Under the assisted wiring scheme 15,314 houses have been connected, and there are 4,000 applications outstanding; about 1,000 installations are being wired per month. There is every indication that the recently adopted hire-purchase scheme, for articles exceeding £2 in value, will lead to further expansion in domestic consumption. The maximum load so far recorded this winter is 32,800 kW. There has also been progress in the supply of power to industries. The entire plant at Colwick Estates has been acquired and closed down, so that all the works in this rapidly growing industrial area now utilise the Corporation supply.

Padiham.—OVERHEAD LINES.—The Central Electricity Board is to proceed with the erection of overhead lines from Padiham to Nelson, and Padiham to Accrington.

Ripon.—ELECTRICITY FOR RURAL AREAS.—The Electricity Committee has asked the consulting engineer to obtain tenders for the three sections of the scheme for the extension of the electrical distribution system to the rural areas.

STREET LIGHTING.—Experimental electric street lamps have been erected in Ripon, 3d. per kWh being charged for the electricity consumed. The gas manager and city engineer are to prepare details of costs of lighting both by electricity and gas before the Council comes to a final decision with regard to street lighting.

NEW FEEDER CABLE.—A feeder cable is to be laid at a cost of £1,350 for boosting the supply in the Harrogate Road area.

Salford.—CHEAPER ELECTRICITY.—The Electricity Committee recommends the reduction of the "unit" charge under the all-in domestic rate to ½d. for all energy consumed in excess of 400 kWh per quarter.

Sheffield.—CHANGE-OVER.—The Electricity Committee has obtained sanction to a loan of £7,341 for mains in connection with the change-over from d.c. to a.c.

South Africa.—NEW ELECTRICITY SCHEMES.—The Parys Town Council has approved a scheme prepared by Mr. G. A. Stewart, consulting engineer, Johannesburg, for the proposed change-over of the electricity supply system from d.c. to a.c. at a total cost of about £19,000. The Tramways and Lighting Committee of Johannesburg City Council has recommended that application be made to the Provincial Administrator for sanction to a loan of £100,000 for improvements to and extensions of the electricity supply distribution system.

Tynemouth.—YEAR'S WORKING.—We have received from Mr. C. Turnbull, borough electrical engineer, a copy of his report for the year ended March 31st last. Despite reductions in charges there was an increase from £57,171 to £60,059 in revenue, and income from special supply brought this figure up to £69,116 (£67,745 in 1929-30). Working expenses totalled £43,580 (£44,371), and there was, after paying all charges and contributing £2,094 to the relief of rates, a net surplus of £5,859 (£3,519). Capital expenditure during the year amounted to £11,295, bringing the total spent on the undertaking to £267,388. A decrease from 747,799 to 307,895 kWh in the energy consumed by the tramways was practically compensated for by increased sales in other departments, the total sales (excluding special supplies) being 6,001,046 kWh as against 6,085,053 kWh; special supplies fell from 2,734,341 to 2,309,741 kWh. Assisted wiring still remains popular and during the year 530 new installations were completed.

United States.—MUSCLE SHOALS BILL.—According to the *Electrical World*, a Bill authorising the disposal of Muscle Shoals to the States of Alabama and Tennessee for $100,000,000, the properties to be operated under the direction of three groups of three members each, named respectively by President Hoover and the Governors of Alabama and Tennessee, has been introduced at Washington. It is said to be along the lines of a proposal worked out in the summer by President Hoover's War Department representives on the Muscle Shoals Commission. The Bill provides also for a loan to complete the Cove Creek Dam project.

A 770,000-KW STATION.—When the installation of the 160,000-kW unit (No. 8) in Hudson Avenue station is completed, this plant will have the highest rating of all single generating stations in the world—namely, 770,000 kW, according to a statement by Mr. G. L. Knight, Brooklyn Edison Company.

Weardale (Durham).—PRICE REDUCTIONS.—The Cleveland and Durham County Electric Power Co. has decided to reduce its charge to prepayment consumers by 1d. per kWh. Charges to large consumers are also to be reduced.

Yeovil.—RURAL ELECTRIFICATION.—The Rural District Council has received details from the Wessex Electricity Company of its proposals for the development of the supply of electricity to the parishes of West Camel, Marston Magna, Yeovilton, Limington, Ilchester, Northover, Rimpton and Mudford, and has decided to offer no objection provided that the houses erected by the Corporation are given supplies.

York.—SUPPLY TO FACTORY.—The Electricity Committee is to apply for sanction to a loan of £3,250 for cable and £500 for meters and switchgear in connection with the new supply of electricity to the factory of Messrs. Rowntree & Co., Ltd.

PUMP REQUIRED.—The Streets Committee is to obtain tenders for an additional electrically driven centrifugal pump, estimated to cost £900, for the Fulford sewage works.

Traction

Burnley.—THE TRANSPORT DEFICIT.—Means for extinguishing the loss at the rate of £8,000 per annum on Burnley's transport undertaking has been considered. Application is to be made for a reduction in the electricity charge for the trams. Penny fares are to be abandoned, and a minimum fare of 1½d. is to be introduced. School children's tickets are to be increased from 6d. per book to 7d., and those available within and without the borough from 1s. to 1s. 2d. Charges to the Education Committee for special tickets are to be advanced from ½d. to 1d. per ticket, and the payments made for councillors' passes increased from £100 to £200. An appeal is also to be made against the undertaking's assessment. The substitution of 'buses for trams on the Harle Syke—Rosegrove route will take place immediately the whole fleet of sixteen double-decker omnibuses has been delivered.

Indo-China.—ELECTRIC TRACTION.—The Compagnie Française des Tramways (Indo-China), which operates a system of light railways in Indo-China, is gradually converting them from steam to electric traction. Several lines have already been converted, while work is now in hand on the 13-mile section between Govap and Thudaumont and the 8-mile line between Govap and Hocmon.

Middlesbrough.—TRAMWAY ABANDONMENT. — The tramway service between Middlesbrough and Norton was discontinued on December 31st. A 'bus service has been substituted.

Newcastle-upon-Tyne.—MORE DIESEL-ELECTRIC RAILCARS.—Sir W. G. Armstrong, Whitworth & Co., Ltd., have completed two additional 250-b.h.p. Diesel-electric railcars. It is understood that the new locomotives are to undergo extensive trials in other parts of the country. Each car carries sixty passengers.

The new Wembley Park signal box (Metropolitan Railway). The equipment comprises 90 section levers and an electrical diagram indicator

Portsmouth.—RECONSTRUCTION OF TRACK.—The Corporation is to proceed with the reconstruction of the tramway track between Portsbridge and Cosham at a cost of £6,000.

South Africa.—DURBAN.—Receipts from the tramways for the year ended July 31st last show a decrease of £19,245 as compared with the preceding year, the number of passengers carried being 2,135,515 fewer.

South Shields.—AUTOMATIC TRAFFIC CONTROL.—The Tramways Committee has given permission for the fixing of automatic traffic control signals on tramway standards in various parts of the town.

Communications

Belgium.—TRUNK TELEPHONY.—A second telephone trunk line is being erected between Liège, Verviers, and Herbesthal on the Belgo-German frontier, where it will connect up with a new line extending to Aix-la-Chapelle, a distance of about 38 miles. Both lines are being erected by the Siemens & Halske Co., of Berlin. Between Liège and Verviers the cable will comprise 249 pairs of conductors, between Verviers and Herbesthal 141 pairs, and between Herbesthal and Aix-la-Chapelle 101 pairs.

France.—DUTIES ON RADIO APPARATUS.—Foreign competition having become more severe, steps are being taken by the Federation of French Wireless Industries to protect its interests, and support is being given to proposals that wireless material coming from abroad should be subject to specific Customs duties instead of *ad valorem* duties as at present. Members are also recommended not to repair foreign goods or to manufacture apparatus enabling such goods to be adapted to French requirements, reports *World-Radio*. The question of manufacturing valves of American type is also being examined.

Great Britain.—INCREASED USE OF THE TELEPHONE.—Notwithstanding the unfavourable economic conditions which prevailed during 1931, the total number of telephones in the country increased by over 80,000. The *T. & T. Journal* estimates that there were about 2,039,000 Post Office telephones working on December 31 last, which, with the addition of some 40,000 non-Post Office telephones, brings the total for Great Britain to nearly 2,080,000. During the year the number of exchanges working rose to about 5,050 (an increase of over 200), and the number of call offices to 36,750, an increase of about 3,000. Over 60 automatic exchanges were opened during the year, serving about 59,000 lines (including six in London serving about 11,000 lines). Moreover, about 4,000 lines in London have been transferred from existing manual to automatic exchanges. The principal provincial centres in which these new exchanges were opened were Newcastle-on-Tyne (12), Bristol (10), Birmingham (6), Manchester (3), Preston, Lancs. (4), Folkestone (5), Watford (3), and Ayr (2). In addition to the foregoing upwards of 290 new rural automatic exchanges were provided during 1931.

Holland.—AUTOMATIC TELEPHONY.—An agreement has been concluded between the Siemens & Halske Co., of Berlin, and the Hengelo Machinery and Apparatus Works, Amsterdam, for the conversion of the Dutch telephone system to automatic operation, says the *Financial News*. Hitherto Siemens's activities in Holland have been mainly connected with the cable business.

Hull.—TELEPHONE EXTENSIONS.—The Corporation Telephones Committee has asked the city architect to prepare plans for the provision of additional automatic switchroom accommodation at the Wiccolmlee exchange.

A LOSS ON EXCHANGE.—The *Birmingham Post* reports that the Committee has declined to reimburse a Continental firm which supplied £1,000 worth of telephone equipment but lost £250 through the adverse rate of exchange when the account was paid.

Radio Licences.—TEMPORARY SETS.—Representatives of the wireless trade and the Post Office radio authorities met this week to consider the licensing of temporarily installed sets. Wireless dealers at present have to take out a licence for each set that they supply on approval; if the set is not bought the licence is wasted. The trade was represented by the Wireless Traders' Association, the Radio Manufacturers' Association, and the Gramophone and Radio Dealers' Association.

Radio Transmitter Power.—NEW RATINGS.—The B.B.C. announces that a modified system of rating the power of all European broadcast transmitters, known as the Copenhagen rating of the International Technical Consultative Committee for Radioelectric Communication, has been adopted by the Union Internationale de Radiodiffusion as from January 1st. While the actual power supplied to the aerials of British transmitters will remain unchanged, their new ratings will be as follows:—The London and Northern national and regional stations (four) 50 kW each; Daventry (5XX) 30 kW; Midland regional (5GB) 25 kW; Aberdeen, Belfast, Bournemouth, Cardiff, Glasgow, and Newcastle 1 kW each; Edinburgh 0.3 kW; Dundee, Plymouth, Sheffield (not radiating at present) and Swansea 0.12 kW each. The maximum peak modulation employed is 80 per cent. in each case.

Somerset.—THE WEST REGIONAL STATION.—The B.B.C. announces that a contract has been signed for the building of the West regional broadcasting station, which will be erected at Washford Cross, near Watchet, Somerset. A number of West Country and London contractors were invited to tender, the successful firm being Messrs. W. T. Nicholls, Ltd., Gloucester. The work will be carried out under the direction and specification of the B.B.C. engineers and will start immediately. The building will be of stone and has been designed to harmonise with the surrounding country. The general layout will be similar to that of the London, Scottish, and North regional stations.

Switzerland.—RADIO RELAYING.—The relaying of broadcast radio programmes to telephone subscribers was commenced over a year ago in Northern Switzerland. According to the *News Chronicle* there are 500 subscribers in Basle, and a similar number in Zurich and Berne. They pay from 5 to 7 guineas per loud speaker, and from 10s. to 20s. for the installation, plus 24s. annually. Half of the cost represents the tax paid by all wireless listeners, plus about one-tenth of a penny for electricity from the mains.

Telephone Service.—NEW EXCHANGE.—The new automatic telephone exchange at Southall (Middlesex) was put into service on January 2nd. This is the first exchange of the single-sided rack-type to be brought into operation in the London area. The equipment was manufactured and installed for the General Post Office by Standard Telephones & Cables, Ltd. The exchange is equipped with 1,700 lines and the ultimate capacity is 5,500 lines.

United States.—RADIO LEGISLATION.—Several wireless Bills are likely to be introduced to Congress shortly. The Treasury is reported to have recommended a retail tax on receivers, while suggestions from other quarters favour taxing the industry or the revenue of broadcasters themselves.

Venezuela.—TELEPHONE SERVICE.—A telephone service, available between 7 and 9 p.m., was inaugurated on January 1st from all parts of Great Britain and Northern Ireland to Venezuela, the route being by wire to Berlin and thence by wireless to Maracay.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Army Contracts.—Manufacturers who are not on the War Office list of tenderers and who wish to be invited to tender for general stores should apply to the Director of Army Contracts, Caxton House, Tothill Street, S.W.1. (See this issue.)

Australia.—BARRON FALLS HYDRO-ELECTRIC BOARD.—March 28th. Two 2,000-h.p. water turbines with alternators and switchgear, &c. Plans and specifications (deposit £2 2s.) from Mr. A. E. Wilkinson, clerk to the Board, Council Chambers, Cairns.

Belgium.—BRUSSELS.—January 13th. Société Nationale des Chemins de Fer Belges, Service du Matériel, Division des Achats, Bureau 26-5, 21, Rue du Louvain, Brussels. Nineteen sets of motor-generators for electric signalling sub-stations.

Bentley-with-Arksey (WEST RIDING).—January 14th. County Education Committee. Electric lighting installation at the special subjects' block at the Bentley Road Council School. Specifications from the education officer, County Hall, Wakefield.

Birtley (DURHAM).—Parish Council. Alterations to overhead electric lighting. Particulars from Mr. F. Ridley, clerk, 29, Neville Crescent, Birtley.

Blackpool.—January 25th. Town Council. Stores, including electrical materials, for year 1932-3. Specifications from the borough treasurer, Town Hall.

Brampton Bierlow (WEST RIDING).—January 14th. County Education Committee. Electric lighting installation at new infants' school. Specifications from the education officer, County Hall, Wakefield.

Cheadle and Gatley.—February 9th. Electricity Department. General stores. (See this issue.)

Edinburgh.—January 13th. Corporation. Various works at valve house to be erected at Portobello power station. Schedules, &c., from the city architect.

Epsom.—January 11th. Urban District Council. Wiring under assisted wiring scheme. Particulars from Mr. H. W. Watts, resident electrical engineer.

Egypt.—CAIRO.—January 23rd. Ministry of the Interior. 3,175 meters for Mansourah. (A.X. 11215.)

February 18th. Diesel engine driven power station (400 kVA) for Samallout. (A.X. 11209.)* Water works with electric pumping equipment for Samallout. (G.X. 10962.)*

Erith.—January 27th. Electricity Department. Transformers. (See this issue.)

Faversham.—January 18th. Town Council. Wiring and fittings for 50 houses under hire-purchase scheme. Particulars from the borough electrical engineer.

Hull.—January 19th. Electricity Department. General stores. (See this issue.)

Irish Free State.—DUBLIN.—Commissioners of Public Works. Installation of electric lighting at McKee Military Barracks. Particulars from Mr. T. Cassedy, secretary, Public Works Office, Dublin.

Liverpool.—January 21st. Corporation. Twelve months' supply of electrical materials. (January 1st.)

London.—CENTRAL ELECTRICITY BOARD.—January 25th. Construction of site works, foundation works, &c., (*a*) at Portishead and Upper Boat for the South-West England and South Wales Electricity Scheme, and (*b*) at Carlisle, Padiham and Kearsley for the North-West England and North Wales Electricity Scheme. (December 18th.)

February 15th. Central indication and telephone equipment and supervisory control equipment in the North-West England and North Wales area. (December 18th.)

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—February 18th. Auxiliary switchgear and accessories for the Barking power station extensions. (See this issue.)

Manchester.—January 12th. Transport Committee. Cadmium copper trolley wire. Specifications, etc., from the general manager, City Transport Dept., 55, Piccadilly, Manchester.

January 30th. Electricity Committee. Supervisory control gear and sheet-steel neutral earthing cubicles, &c., for power transformers at the Queen's Park sub-station. (See this issue.)

New Mill (NEAR HUDDERSFIELD).—January 20th. Urban District Council. Overhead lines. (January 1st.)

New Zealand.—WELLINGTON.—February 23rd. Public Works Department. Four 1,000-kVA single-phase transformers, with automatic voltage regulating equipment. (A.X. 11213.)*

February 9th. Control and power cables for Waitaki power station. (A.X. 11214.)

Northern Ireland.—BELFAST.—January 22nd. Electricity Department. General stores. (January 1st.)

January 25th. Tramways Department. General stores. (See this issue.)

Portsmouth.—January 14th. Electricity Department. Overhead e.h.p. and l.p. lines in East Hants and West Sussex. (January 1st.)

Sheffield.—January 15th. Tramways and Motors Committee. Tramcar tyres, tramway rails, copper bonds, fishplates and bolts, tie bars, and sole plates. Specifications from Mr. A. R. Fearnley, general manager, Division Street, Sheffield.

Southend-on-Sea.—February 3rd. Electricity Department. General stores. (January 1st.)

West Ham.—January 18th. Education Committee. Installation of electric lighting at Carter Road Central School. (December 25th.)

Wolverhampton.—January 9th. Corporation. Electrical installation at the Wolverhampton and Staffordshire Technical College. (January 1st.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Australia.—MELBOURNE.—City Council. Accepted. Ornamental street lanterns and brackets.—Australian General Electric Co., Ltd.; C. Ebeling & Sons Pty., Ltd. Nine oil circuit breakers.—Security Electric and Mfg. Co. Paper-insulated cable—Enfield Cable Works (A/sia), Ltd. A.c. motors and starters.—Metropolitan-Vickers Aust. Pty., Ltd.; Noyes Bros. (Melb.) Pty., Ltd.; Scott & Co.; A. M. Bridger; W. H. Lowe & Co.

BRISBANE.—City Council. Accepted. 550 strings of strain type insulators.—Evans, Deakin & Co. 850 pin type insulators.—Kendall, Knight & Co., Ltd. Four sets lightning arresters.—Australian Westinghouse Electric Co., Ltd. Two 1,500-kVA, 11,000/33,000-V transformers.—British Electric Transformer Co., Ltd.—*Electrical Engineer and Merchandiser.*

Barking.—Electricity Committee. Accepted. Cable.—Metropolitan Cables, Ltd. (£172); Derby Cables, Ltd. (£294). Two 250-kVA transformers (£218).—Hackbridge Electric Construction Co., Ltd. E.h.p. switchgear (£323).—New Switchgear Construction Co., Ltd. Switchgear (£105).—Electric Construction Co.

Barrow-in-Furness.—Electricity Committee. Recommended. Protective gear (£2,454).—Metropolitan-Vickers Electrical Co., Ltd.

Birkenhead.—Electricity Committee. Accepted. 200-kVA transformer.—Metropolitan-Vickers Electrical Co., Ltd. Five switch cubicles.—New Switchgear Co., Ltd.

Birmingham.—Watch Committee. Accepted. Electric passenger lift at central police station.—John Bennie, Ltd.

Education Committee. Accepted. Electric lighting and power installation at Cropwood open air school.—Gordon Hughes Electrical Co., Ltd. Electrical work at Oakley Road school.—Walter S. Vaughan, Ltd. Electric lighting at Handsworth school.—Baxter & Impey. Electric lighting at Weoley Castle school.—Davis & Millward. Electric lighting at Dartmouth Street school.—T. Glover.

Salvage Committee. Accepted. Electric vehicle charging equipment at Tyseley depôt and electric lighting apparatus at Rotton Park Street depôt.—United Electrical Co. (Birmingham), Ltd.

Croydon.—Electricity Committee. Recommended. Plant for Kingsdown sub-station: Switchgear (£543).—A. Reyrolle & Co., Ltd. Oil switches (£189).—Ferguson, Pailin, Ltd. One 1,000-kVA transformer (£360) and one 500-kVA transformer (£188).—Crompton Parkinson, Ltd.

Leeds.—Electricity Committee. Accepted. Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£306); Macintosh Cable Co., Ltd. (£430); Edison Swan Cables, Ltd. (£589).

Tramways Committee. Accepted. Points and crossings (£1,788).—Hadfields, Ltd. Special trackwork.—Titan Trackwork Co., Ltd. (£1,598); Edgar Allen & Co., Ltd. (£2,020).

Finance Committee. Accepted. Electrical installation at civic buildings (£4,870).—S. Dixon & Son, Ltd.

London. — SOUTHWARK. — Electricity Committee. Recommended. Cable (£2,969).—Connollys (Blackley), Ltd. Feeder pillar (£48).—W. Lucy & Co., Ltd.

Norfolk.—County Council Assistance Committee. Accepted. Electrical installation at Swainsthorpe Institution (£295).—C. C. Fisher (in place of withdrawn tender).

Salford.—Electricity Committee. Recommended. Sub-station fuse boards (£461).—English Electric Co., Ltd.

Slough.—Urban District Council. Accepted. Installation of electric lighting at the temporary offices.—T. Bridger.

Wimbledon.—Electricity Committee. Recommended. Time switches (£2,567).—Bowden Bros., Ltd.

Worthing.—Municipal Buildings Committee. Accepted. Electric lighting fittings for clinic (£87), and electrical installation of municipal buildings (£1,448).—Grierson, Ltd. Lifts at municipal buildings (£440).—Hammond Bros & Champness, Ltd.

Forthcoming Events

Institution of Electrical Engineers.—Monday, January 11th. Institution, London. 7 p.m. Informal meeting. Discussion on "The Relative Importance of Current and Installation Costs as Affecting the Sale of Electricity." Opened by Mr. H. T. Young. (*Meter and Instrument Section*).—Friday, January 8th. Institution, London. 7 p.m. "Some Recent Advances in the Design of Relays for the Protection of a.c. Systems." Mr. C. L. Lipman. (*Western Centre*).—Monday, January 11th. Royal Hotel, Cardiff. 6.30 for 7 p.m. Annual dinner. (*North Eastern Centre*).—Monday, January 11. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "The Absolute Measurement of High Electrical Pressures." Prof. W. M. Thornton and Mr. W. G. Thompson. (*North Midland Centre*).—Tuesday, January 12th. Hotel Metropole, Leeds. 7 p.m. "Two Transmission Line Problems: Suspension Insulators for Industrial Areas in Great Britain; Conductor Vibration." Mr. P. J. Ryle. (*Scottish Centre*).—January 12th. Glasgow. 7.30 p.m. "Recent Progress in Large Transformers." Mr. R. M. Charley. "The Application of the Induction Voltage Regulator." Mr. W. E. M. Ayres. (*Scottish Students' Section*).—Tuesday, January 12th. Heriott-Watt College, Edinburgh. 7.15 p.m. "Installation Work." Mr. B. M. D. Cordiner. (*South Midland Students' Section*).—Tuesday, January 12th. The University, Birmingham. 7 p.m. Address by Mr. N. B. Rosher. (*North-Western Students' Section*).—Tuesday, January 12th. Engineers' Club, Manchester. 7.15 p.m. "Photo Electric Cells." Mr. F. Roberts. (*North-Eastern Students' Section*).—Friday, January 15th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. Debate on "That it is for the Benefit of the Engineering Industry that the Salesman should be an Engineer." (*London Students' Section*).—Friday, Janu-

ary 15th. Chiltern Hall, Baker Street, N.W.1. 7.30 p.m. Joint dance with graduates and students of the Institution of Mechanical Engineers.

Electrical Power Engineers' Association (*London Local Group*).—Tuesday, January 12th. Junior Institution of Engineers, London. 7.15 p.m. "Economic Domestic Electricity." Miss C. Haslett. (*Manchester Local Group*).—Wednesday, January 13th. Geographical Hall, Deansgate, Manchester. 7.15 p.m. "Transportation and Erection of Heavy Machinery." Mr. N. E. Box.

Institution of Engineering Inspection.—Wednesday, January 13th. Royal Society of Arts, Adelphi, W.C. 5.30 p.m. "The Comparative Values of Diesel Engines from the Purchaser's Point of View." Mr. G. E. Windeler.

Edinburgh Electrical Society.—Wednesday, January 13th. Y.M.C.A., Edinburgh. 8 p.m. "Electrical Breakdowns and Repairs." Mr. J. Walker.

British Electrical Development Association.—Friday, January 15th. City of London Restaurant, E.C. "What Every Electrical Salesman and Saleswoman should know about Electrical Refrigeration." Mr. A. G. Clausen.

Manchester Electro-Harmonic Society.—Friday, January 15th. Waldorf Hotel, Manchester. 7 p.m. Smoking concert.

Junior Institution of Engineers.—Friday, January 15th. Institution, London. 7.30 p.m. "The Development of the Loud Speaker." Mr. H. J. N. Riddle.

Physical Society.—Friday, January 15th. Imperial College of Science, S.W. 5 p.m. Short papers.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, January 16th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Copper and Aluminium." Mr. B. J. Burkle.

Notes

Diesel-electric or All-electric?

Oil-electrification may be cheaper in first cost, but it cannot enable the traffic manager to give the improved service needed to restore prosperity to the railways, a correspondent to the *Financial Times* states. In the Weir Report it was solely on the basis of direct economies that electrification was calculated to provide a margin of 2 per cent. after meeting interest charges on the new capital. All the "secondary" advantages of electric traction fall to be added.

Electric traction would enable the railway companies to intensify their main line and inter-urban services on more economic terms than with steam traction. No material improvement can be expected under steam traction, as the steam locomotive has already been brought to such a high pitch of perfection. Electrification offers a means of handling the existing traffic at a lower cost than at present, and of enabling a much more frequent and attractive service to be maintained on an economical basis.

The Weir Committee regarded oil-electric units as "possible substitutes for steam on lightly loaded branch lines, and more particularly so in conjunction with a general electrification of main lines."

Major-General Dawnay, chairman of a company that specialises in oil-electric traction equipment, has stated his belief that oil-electric traction would "establish itself as ancillary to electrification." This agreement between an independent body and an interested authority virtually decides the case.

Appointments Vacant

Assistant master for Bolton Municipal Technical College.

Chief clerk for the Southend-on-Sea Electricity Department.

Assistant superintendent of traffic in the London Telephone Service, and assistant traffic superintendent in the provinces, General Post Office.

Clerk for Bingley Electricity Department.

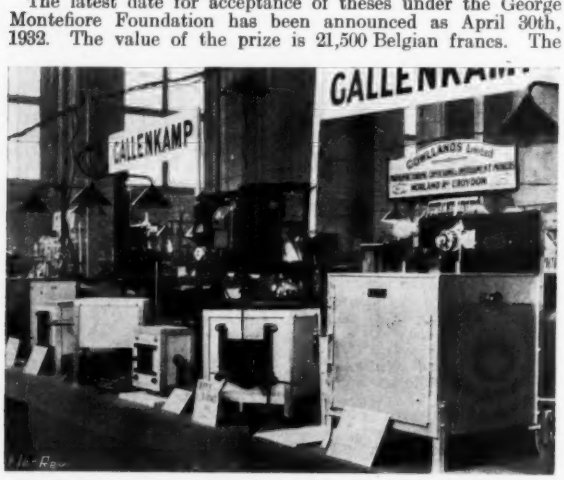
Clerk for Fulham Electricity Department.

Charge engineers for the Kowlon generating station of the China Light & Power Co. (1918), Ltd.

(See our advertisement pages to-day.)

The George Montefiore Foundation

The latest date for acceptance of theses under the George Montefiore Foundation has been announced as April 30th, 1932. The value of the prize is 21,500 Belgian francs. The award is made every three years, as the result of an international competitive examination, for the best original work on the scientific development and technical applications of electricity in all countries. Particulars may be obtained from Le Secrétaire Général, Association des Ingénieurs Electriciens, Rue St. Cilles, 31, Liége, Belgium.



Messrs. Gallenkamp's stand at the Physical Society's Exhibition

A Late Victorian Battery

The accompanying picture shows the D.P. 122-cell 300-Ah battery installed at Loreto Abbey, Rathfarnham, in 1899. The original negative plates are still in use, and the last of the positive plates was renewed only last year. The negative plates are of the Planté type, in the construction of which

A battery installed in 1899

strips of lead were passed between rollers which grooved the surface. The strips were then assembled with spacing pieces between each, and the ends of all the strips were united and a connecting lug formed, a marked contrast to the construction of the present-day sponge type negative plate.

If there should be any D.P. batteries in use which are older than the one shown the D.P. Battery Co. would like to have particulars so that photographs can be obtained for record purposes.

Standard Milling Cutters and Reamers

A revision of British Standards for Milling Cutters and Reamers has just been issued. This publication was first published in 1920 and embodied comprehensive tables. The revision was undertaken in order to make certain modifications which had become necessary as a result of changes in practice.

Copies of the revised publication (No. 122-1931) can be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d., post free.

"Electrics" to Supersede Horses

The Birmingham Salvage and Stables Committee reports that it is proposed to supersede all the horses at the Rotton Park depôt by electric vehicles. This will effect a saving of 1s. per ton in the cost of refuse collection, or a total estimated saving of approximately £1,000 per annum.

Fatality

The death occurred on January 2nd of Frederick Thomas Mansfield, of Mitcham, from electric shock. He was washing a motor car and was holding a flex attached to the lighting installation of the car. He was heard to cry out, and when discovered was unconscious. The flex was knocked from his hand, but when a doctor arrived he was found to be dead.

The I.E.E. Dinner

The annual dinner of the Institution of Electrical Engineers will be held on February 4th at the Connaught Rooms, Great Queen Street, W.C.

Standard Tariffs for Ulster

Details of the tariffs fixed by the Electricity Board of Northern Ireland are given in the *Northern Whig*. The chairman of the Board, Mr. Malcolm Gordon, said that a domestic two-part tariff would be introduced based upon floor area (external measurements), ranging from an annual charge of £1 11s. 3d. for 500 sq. ft. to £10 for 6,000 sq. ft. The secondary charge would be 0.75d. per kWh for the first 2,000 kWh, and 0.5 for the remainder. The flat rate in small towns would be 8d. per kWh for lighting and 1½d. per kWh for heating and cooking. The Board proposes to promote assisted wiring schemes.

For industrial power, the tariff throughout the south-eastern area would be £5 per kW of maximum demand and 0.5d. per kWh for supplies at 11,000 V and £5 10s. per kW and 0.5d. per kWh for 3-phase supplies at 400 V.

The municipal undertakings at Bangor and Holywood have now been handed over to the Board.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of the makers of the following:—

IMP automatic cut-out used for battery charging.

Electric poker for lighting coal fires.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

New Year Honours

The Honours List published on January 1st included a number of gentlemen connected in one way or another with electrical affairs.

The **Rt. Hon. Wilfrid Ashley,** well known to the electrical industry as Minister of Transport from 1924-1929, when electricity supply legislation was so much to the fore, has been made a Baronet.

Mr. W. G. Goodman, M.Inst.C.E., M.I.E.E., general manager of the Municipal Tramways Trust, Adelaide, S. Australia, and **Mr. J. R. Cahill,** Commercial Counsellor to H.M. Embassy in Paris, receive knighthoods.

Captain B. S. Cohen, M.I.E.E., whose portrait accompanies these notes, has been awarded the O.B.E. (Civil Division). Captain Cohen is the director of communications research at the Post Office Research Station, Dollis Hill. He joined the National Telephone Co. in 1896, and was responsible for working out the details for the first iron-core coil-loaded line between Croydon and London, while during the War he was engaged in the development of communications between aircraft and the ground. He has three times received the Fahie Premium from the Institution of Electrical Engineers—in 1907, 1926, and 1928—and is chairman of a Commission of the Comité Consultatif International des Communications Téléphoniques à Grand Distance dealing with telephone transmission systems and methods.

Capt. B. S. Cohen, who has been awarded the O.B.E.

Mr. B. Waite, district manager, Post Office Telephones, South Wales District, and **Mr. R. Withycombe,** director of the Electricity Department, Zanzibar, have also been awarded the O.B.E.

Col. Sir James Lithgow, president of the Federation of British Industries, has been appointed to the Overseas Trade Development Council, and **Mr. Victor Watlington,** chairman of the Council of the British Electrical & Allied Manufacturers' Association and a director of the English Electric Co., Ltd., has been appointed to the Advisory Panel.

Mr. S. E. Bastow, managing director of Bruce Peebles and Co., Ltd., has tendered his resignation to take effect as from December 31st. Mr. Bastow has been in indifferent health for some time and his condition was seriously aggravated by an accident sustained during the return voyage from a business visit to Canada in November, 1930. He joined Bruce Peebles and Co., Ltd., in 1903, but left the company in 1917 to become chief engineer of British Dyes, Ltd. He returned to Bruce Peebles in 1920 as managing director.

Mr. Paul Pescatore, for 34 years works manager at the Tudor accumulator works, Dukinfield, has been presented by the staff with a gold cigarette case as a parting gift. He is about to leave England to take up an appointment in Belgium. The presentation was made by Mr. Soutter, the general manager.

Mr. F. O. Harber, A.M.I.E.E., A.Am.I.E.E., has been appointed town mains superintendent to the Aylesbury Corporation.

Mr. H. N. Dutton, M.I.E.E., has been appointed a director of Messrs. Hammond Bros. & Champness, Ltd., lift and crane makers, of Alfreton Street, S.E.17.

Mr. T. G. Christie, one of the senior members of the technical staff of the Belfast Corporation Electricity Department, has been appointed chief technical assistant to Mr. C. R. Westlake, chief engineer and manager of the Electricity Supply Board of Northern Ireland. Mr. Christie was with the Metropolitan-Vickers Electrical Co., Ltd., before going to Belfast.

We regret to learn from the *Electrical Contractor* that **Mr. J. Orringe,** of Leicester, a past-president of the Electrical Contractors' Association, was recently involved in a motor car accident. We hope, with our contemporary, that he will make a speedy recovery from the effects of this mishap.

Mr. C. G. Moody-Smith, of the Woolwich Borough Council Electricity Department, was married on December 31st to Miss L. Riddell, of Eltham.

The marriage took place at Tettenhall on December 22nd of **Mr. Reginald Henaky,** an official of the West Midlands Joint Electricity Board, and Miss C. M. Benton, of Wednesbury.

We regret to learn that **Mr. William Graham,** the President of the Board of Trade in the late Labour Government, is lying ill with pneumonia at his home at Hendon.

The Birmingham Chamber of Commerce, at a meeting of the Council on January 4th, appointed **Dr. A. H. Railing,** of the General Electric Co., Ltd., and **Mr. T. R. Martin** as electrical goods and apparatus representatives on the Tariff Consultative Committee of the Association of British Chambers of Commerce for dealing with abnormal importations.

A *Reuter* message from the Hague states that the resignation is announced of **Mr. Van Sandick,** the general secretary of the Royal Institution of Engineers and chief editor of *The Dutch Engineer.* He has been awarded the gold medal of the Institution of Engineers, and the Prince Consort presided at a reception given in his honour. Among the many letters received by Mr. Van Sandick on his retirement were several from British engineering colleagues and friends, including one from the British Institution of Electrical Engineers.

Mr. G. E. Soulsby, of Dipton, Durham, has been appointed resident electrical engineer to the Tanfield Urban District Council.

Mr. Arthur J. Lees, the Parliamentary agent and secretary of the Urban District Councils' Association, has accepted the position of honorary solicitor to the Association of Consulting Engineers (Inc.).

Mr. C. S. Merriman is resigning his position with the Brush Electrical Engineering Co., Ltd., and is joining Messrs. J. H. Holmes & Co., Ltd., as their branch manager in the Lancashire area. His address will be 9, St. James Square, Manchester.

Mr. Harry Allcock recently read a paper before the Manchester Society of Chartered Accountants on "Simpler British Coinage." It will be found in the December issue of the *Decimal Educator.*

Following upon his recent resignation of the appointment of London sales manager on the staff of Philips Lamps, Ltd., **Mr. H. D. Harris** was presented with a gold watch and a box of cigars by members of the staff. Until Mr. Harris makes an announcement regarding his future activities communications should be addressed to 4, Avondale Road, South Croydon, Surrey.

Mr. John H. Sandiford, A.M.I.E.E., has been appointed sales manager for the London and Home Counties for Messrs. George H. Scholes & Co., Ltd., the manufacturers of "Wylex" electrical products. His present address is 44, Linden Road, Muswell Hill, London, N.10.

Obituary

Mrs. Hollingsworth.—Many of our readers will desire to join with us in expressing sympathy with Mr. E. M. Hollingsworth, of the I.C.I. (General Chemicals), Ltd., power station, West Bank, Widnes, on the death of his wife, which occurred last week.

Mr. A. J. Barlett.—We regret to announce the death of Mr. A. J. Barlett, the sales superintendent of Petters, Ltd., which occurred on December 26th after a short illness. He had been connected with the company for over twenty years, and was a well-known and popular figure at leading agricultural shows and exhibitions. A wide circle of friends will deplore his loss at the early age of 43. Mr. Bartlett at one time was a director of Yeovil & Petters United Football Club.

The late Mr. A. J. Bartlett

Mr. F. Gibbons.—The death occurred at the Sussex County Hospital, Brighton, on January 1st, of Mr. Frederick Gibbons, works electrical engineer, of the Brighton, Lancing, and Ashford locomotive works of the Southern Railway Co. Mr. Gibbons was crossing the metals just outside Brighton station on December 30th when his foot became wedged in some points and before he could extricate himself he was knocked down and run over by a light engine.

Mr. John Denham.—The death is reported at Douglas, Isle of Man, of Mr. John Denham, M.I.E.E., M.I.Mech.E., late Government Inspector of Mines, Johannesburg, and Chief Electrical Engineer of Railways, Capetown.

Mr. A. Moses.—The death took place on December 27th of Mr. A. Moses, who was for many years in business as an electrical engineer at the Ribstone works, Hebden Bridge, Yorks. He was 68 years of age, and commenced with the late Mr. R. S. Blackburn, who was one of the pioneer electrical engineers at Hebden Bridge.

The Dniepr Hydro-electric Scheme

THE Soviet's Dnieprostroy plan consists, first, in making the Dniepr, which is a most important waterway, economically navigable along its whole length down to the Black Sea, and secondly in making use of its enormous power resources.

Near Kichkas village, a little below the last falls, the Dniepr

Erecting the last turbine at the Dniepr station

will be held up by a dam, made to curve against the current, 767 metres long, 62 metres high, and 40 metres thick at the base. This dam will raise the water level 37 metres above the present height, which will make the river spread correspondingly in width.

The water retained by the dam will drive nine hydraulic turbines of 90,000 h.p. each in a power station of 810,000 h.p. capacity, the largest in Europe, which is being built on the right bank to the left of the dam. A sluice is being built on the left bank, for the passage of ships up and down the stream. This sluice is in three sections with three grades of 12.5 metres each; the steps are hewed from granite.

When completed, the Dniepr station will yield 2,500,000,000 kWh per year, which will mean an economy of three million tons of coal. The station will transmit its energy by a network of conductors supported on steel masts, along both banks, to Zaporojye, Nicopol, Krivoy-Reg, Dnepropetrovsk, Kamenskoye, Kharkoff, and the Don Basin.

The region covered has over five million inhabitants. In pre-War days half the grain exported from Russia came from this area. It also contains extremely rich deposits of manganese ores and kaolin. Adjacent to this region is the Don Basin with its inexhaustible reserves of coal.

The great Dnieprovsk industrial works are being built in direct connection with the station, from which power will be supplied at 0.25d. per kWh. The works will comprise: a metallurgical section, with a yearly output of one million tons of pig-iron; the "Dnieprostal" plant, which will produce 100.000 tons of various kinds of steel; a plant for smelting ferrous alloys; an aluminium plant; a mineral fertiliser factory, &c.

The capital cost of the hydraulic power station will be 200 million roubles, and the industrial works will cost over 400 million roubles. The Dnieprostroy is of great importance to Russian economy as metallurgy will be developed and agriculture industrialised by it on an enormous scale, since the Dnieprostroy plan also covers the irrigation of large tracts of dry lands and also the draining of afeas which are constantly flooded by the river.

Moreover, the new channel for transport which will be opened, when the Dniepr is navigable along its whole length, will make it possible to send grain from the most fertile parts of Russia to the Black Sea. Timber will be sent down the same way from the upper reaches of the Dniepr, where it grows in abundance. Metals and the metallic products of the Dnieprovsk will be sent up river, thus avoiding expensive railway freight. Oil, which up to now has travelled mostly along the Volga, will be sent by way of the Dniepr to the centre of the country. The scheme is expected to be complete by May 1st, 1932.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

C. F. Braun & Co.—(Incorporated outside Great Britain.)—Particulars filed December 22nd, pursuant to Section 344 of the Companies Act, 1929. Capital, $10,000,000 in $10 shares ($2,000,000 preferred stock and $8,000,000 common stock). The company was incorporated in California, U.S.A., in May, 1909, to manufacture and deal in electric motors, generators, dynamos, &c. The British address is at Bush House, Aldwych. W.C.2, where C. S. Snodgrass is authorised to accept service of process and notices on behalf of the company. The directors are: C. F. Braun, J. A. Marchant, G. C. Singletary, Winifred H. Braun, and V. V. Jacomini, all of California.

Enfield Conduits Co., Ltd.—Private company. Registered January 1st. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians, mechanical engineers and manufacturers, &c. The subscribers are: H. W. Martin, Parliament Mansions, Victoria Street, S.W.1, and A. W. Kent, Glenalva, St. James Avenue, Farnham, Kent. The first directors are to be appointed by the subscribers. Secretary: H. W. Martin. Registered office: 1, Queensway, Ponders End, Middlesex.

H. Bailey & Co., Ltd.—Private company. Registered January 2nd. Capital, £2,000 in £1 shares. Objects: To acquire the business of an electrical, mechanical, and wireless engineer, now carried on by H. Bailey at 51, Manchester Road, Denton, Lancs, as "H. Bailey & Co." The permanent directors are: H. Bailey (chairman and managing director) and Mrs. N. Bailey, "Lonsdale," Hyde Road, Gorton, Manchester.

Wembley Manufacturing Co., Ltd.—Private company. Registered January 1st. Capital, £5,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in radio and electrical goods and appliances, gramophone sets and accessories, electricians, mechanical engineers, &c., and to adopt an agreement with Merrington Bros., Ltd. The subscribers are: A. Wilson, 62, Myddelton Square, E.C.1, and V. E. Davey, 77, Central Park Road, East Ham, E.6. T. D'Amery is permanent governing director. Solicitors: Zeffertt & Heard, 17, Coleman Street, E.C.

Nash Products, Ltd.—Private company. Registered January 4th. Capital, £600 in £1 shares. Objects: To acquire the business of Bat Products of 149, Bath Row, Birmingham, as manufacturers of wireless components and accessories, &c. The directors are: H. E. Nash, 331, Olton Boulevard East, Acocks Green, Birmingham, and Frances M. Starling, 93, Victoria Road, Stechford, Birmingham. Registered office: 93, Victoria Road, Stechford.

Brady & Mann, Ltd.—Private company. Registered January 1st. Capital £400 in £1 shares. Objects:—To acquire the business of electricians and dealers in radio supplies carried on at Ripon, York, as "Brady & Mann." The permanent directors are:—J. C. Mann and R. G. Mann, both of 127, King's Road, Harrogate. Secretary: R. G. Mann.

Nunnery Electrical Co., Ltd.—Private company. Registered December 29th. Capital £1,000 in £1 shares. Objects:—To carry on the business of armature winders, electrical and mechanical engineers and contractors, suppliers of electricity, manufacturers of electrical apparatus and accessories, &c. The subscribers are:—E. J. Capper, 20, Parkers Road, Broomhill, Sheffield; and D. L. Jones, 7, Newington Road, Sheffield. The first directors are:—E. J. Capper (permanent) and two others to be appointed by the subscribers.

Craig Greenhill Engineering Co., Ltd.—Private company. Registered in Belfast on December 17th. Capital £6,000 in £1 shares. Objects:—To acquire the business of electrical and engineering manufacturers, merchants and contractors carried on by Greenhill and Craig. The directors are:—A. F. Craig, Helens Bay, Co. Down; G. A. Wilson, Lisburn; C. A. Brett, Holywood, Co. Down; S. F. Tatton-Hibbs, 103, South Parade, Belfast; and T. Boyd, 100, Clifton Park Avenue, Belfast. Secretary: T. Boyd. Registered office: 66, Ballarat Street, Belfast.

Laighpark Electric Motors, Ltd.—Private company. Registered in Edinburgh December 31st. Capital £100 in £1 shares. Objects:—To acquire the whole or any part of the assets of Walter McGee & Son, Ltd., engineers, Albion Engineering Works, Laighpark, Paisley. The directors are:—M. Neilson, 36, Eldon Street, Greenock; J. Laird, Windyknowe, Dunblane, Perthshire; and D. A. Mackeggie, Milverton, Lenzie, Glasgow. Solicitors: MacRobert, Son & Hutchison, 51, Moss Street, Paisley.

Radio & Electrical Traders, Ltd.—Private company. Registered in Dublin, December 31st. Capital, £500 in 500 shares of 10s. and 1,000 shares of 5s. each. Objects: To carry on the business of manufacturers of and dealers in wireless telegraph, telephone and television apparatus, &c. The subscribers are: P. Callan and D. H. McCarthy, both of 9, Westmoreland Street, Dublin.

Cricklewood Wholesale Electric, Ltd.—Private company. Registered January 1st. Capital £750 in £1 shares. Objects:—To carry on the business of dealers in electrical and gas fittings, gramophones and wireless, electrical, gas and wireless installers, electricians, &c. The first directors are:—D. S. Cramb, "Auld Reekie," Dudden Hill Lane, Neasden, N.W.10; and W. Bates, 11, Askew Mansions, Shepherd's Bush, W.12. Secretary: D. S. Cramb. Registered office: 212, The Broadway, Cricklewood.

Grimston Electric Tools, Ltd.—Private company. Registered December 31st. Capital £5,000 in £1 shares. Objects:—To acquire the goodwill and connection of the branch business of

Grimston Prichard & Plutte, Ltd., manufacturers and suppliers of and dealers in electric and other tools, carried on by them at 138, Lever Street, E.C.1. The directors are:—P. Halfter, 121, Perry Vale, S.E.23; and C. L. Morris, 1, Thurlow Hill, S.E.21. Secretary: T. A. Blow, Hut Wood, Hatfield Road, near Oaklands, St. Albans. Registered office: Swinton House, 324, Gray's Inn Road, W.C.1.

Returns of Electrical Companies

Weald Electricity Supply Co., Ltd.—Capital £300,000 in £1 shares. Return dated August 4th, 1931. 250,000 shares taken up. £246,000 paid. £4,000 considered as paid. Mortgages and charges at date of return £100,000.

Satisfaction in full on December 18th of charge dated December 21st, 1929, and registered January 2nd, 1930. (According to the register of mortgages the charge registered January 2nd, 1930, originally secured all moneys due or to become due from the company to the Westminster Bank Ltd.)

J. L. Hills Manufacturing Co., Ltd.—First debenture dated December 23rd, to secure £300, charged on the company's property, including uncalled capital. Holders: Universal Rubber Co., Ltd., 34/36, Kingsland Road, E.2.

Brundall & District Service Co., Ltd.—Satisfaction to the extent of £4,000 on October 7th, 1930, of debentures authorised October 8th, 1927, and registered November 12th, 1927. (Notice filed December 30th, 1931.)

Claude Lyons, Ltd.—Capital, £500 in £1 shares. Return dated December 5th, 1931. 430 shares taken up. £280 paid. £150 considered as paid. Mortgages and charges: Nil.

E. J. Wilcock, Ltd.—Capital, £1,000 in 500 preference and 500 ordinary shares of £1. Return dated October 9th, 1931. 351 preference and 500 ordinary shares taken up. £851 paid. Mortgages and charges: Nil.

Eco Power, Ltd.—Capital, £1,000 in £1 shares. Return dated November 4th, 1931. All shares taken up. £1,000 paid. Mortgages and charges: Nil.

Mandaw Co., Ltd.—Capital, £20,000 in £1 shares. Return dated October 2nd, 1931. All shares taken up. £20,000 paid. Mortgages and charges: Nil.

Radios Electrical, Ltd.—Debenture dated November 30th, 1931, to secure £300, charged on the company's undertaking and property, including uncalled capital. Holder: D. Tanner, 113, Beresford Avenue, Tolworth.

Dolywern & District Electricity Supply Co., Ltd.—Particulars filed of £400 debentures authorised October 17th, charged on the company's undertaking and property, including unpaid capital, the whole amount being now issued.

City Notes

John Shaw & Sons (Wolverhampton), Ltd., held their annual meeting on December 30th, Mr. G. Terrell (chairman) presiding. In presenting the report and accounts (ELEC. REV., January 1st, p. 33), the chairman said that their Indian establishment had suffered a heavy reduction in sales, but still showed a small profit. They had at the moment a fair order book, but he was doubtful whether the current year, unless things took a sudden turn for the better, was going to do more than enable them to pay their way. The past year's loss included the usual heavy writing-off for depreciation of machinery and buildings. They had some substantial orders for their new labour-saving machinery for jute mills. For the John Shaw business it had been a year of depression and sales were down, the result being a loss. They had written down their investment in 2½ per cent. India Stock, and had also made a heavy cut in the stocks of their Electrical Department. Their total writing down came to over £14,000. The report and accounts were adopted.

Bullers, Ltd., report a loss, after deducting all charges, including depreciation, debenture interest, &c., of £11,005. It is proposed to take £15,000 from general reserve, and after adding the balance brought in and deducting the loss of £11,005, there will be a balance of £8,357, from which has to be deducted the preference dividend, leaving £857 to be carried forward.

The Electric Furnace Co., Ltd., has paid the half-yearly interim dividend for the six months ended September 30th, 1931, at the rate of 7 per cent. per annum, less tax, on its cumulative preferred ordinary shares.

Agricultural & General Engineers, Ltd., held their annual meeting on December 30th, when Mr. G. E. Rowland (chairman), who presided, reviewed the events which led to the decision to ask Sir Gilbert Garnsey and Lord Plender to carry out an investigation into the company's affairs. The auditors had notified the board that they would not be able to sign their report on the balance sheet for the year ended March 31st last in time for the meeting; it was therefore decided that the meeting should be adjourned.

Turner & Newall, Ltd., report net trading profits for the year ended September 30th last of £530,037, after providing for losses of subsidiary companies, as compared with £1,101,846 in the preceding year. Provision for taxation and directors' fees absorb £169,159, leaving a net balance of £360,879 (£829,767). It is proposed to pay a final ordinary dividend of 2½ per cent., making 5 per cent. for year (against 11½ per cent.), and to carry forward £34,840. Meeting: January 28th.

The Charing Cross Electricity Supply Co., Ltd., held a meeting on December 30th, when resolutions were passed for increasing the capital of the company and capitalising £63,914 standing to the credit of the reserve account (West End Undertakings) and £93,151 standing to the credit of the reserve account (City Undertakings).

The Pennsylvania Water & Power Co. reports a net income for the eleven months ended November 30th, after providing for renewals reserve, replacements, &c., of $1,836,074, which is equivalent to $4.27 on the common shares outstanding, or $5.04 per share, before providing for reserve and replacements. This compares with $4.53 per share for the year ended December 31st, 1930.

The Vera Cruz Electric Light, Power & Traction, Ltd., reports a net revenue of £23,162, to which is added other income, making £24,557. After providing for debenture interest, &c., there is a net divisible income of £11,577, this, with direct credits (£1,004) and the balance of £152 brought in, a total of £12,733, is carried forward.

The Chelsea Electric Supply Co., Ltd., held an extraordinary meeting on December 31st, when resolutions were carried authorising the increasing of the capital to £460,000 by the creation of 10,000 additional ordinary shares of £1 each, and the capitalisation and distribution of £23,387 standing to the credit of the special reserve fund.

The United River Plate Telephone Co. has declared an interim dividend of 3 per cent. (actual) on the ordinary shares (British residents subject to tax).

The Westinghouse Brake & Saxby Signal Co., Ltd., reports a profit of £90,054 for the year ended September 30th last, as compared with £102,558 in the preceding year, to which is added £14,709 brought in, making £104,763. It is proposed to place £32,500 to reserve and to pay a dividend of 5 per cent. (8 per cent.), less tax at 4s. 1½d., leaving £27,719 to be carried forward. Meeting: January 15th.

The Power Corporation of Canada has announced the regular dividend of 50 cents per share on the no-par-value common stock for the quarter ending January 31st.

Stocks and Shares

TUESDAY EVENING.

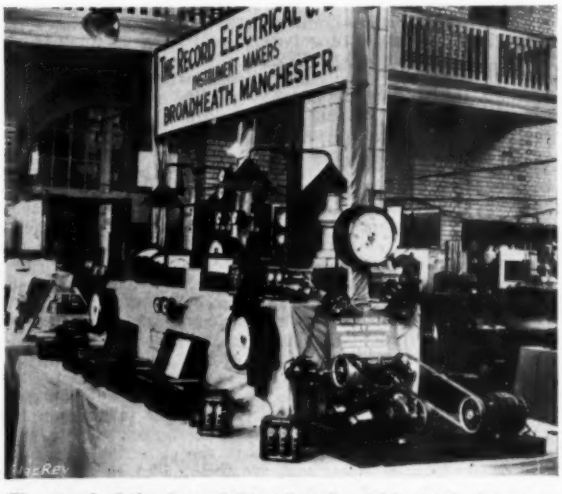
THE New Year opened in the Stock Exchange with a hopeful feeling, caused by the possibility of money becoming cheaper in the early future. There has been a vague anticipation that the Bank Rate would come down before the end of the old year, and the non-fulfilment of this hope was regarded as no more than a postponement of the event. So much must depend upon the result of the International Conference, to be held in about a fortnight's time, to consider the questions which surround reparations payments that the Bank of England Court no doubt feel the necessity of walking as delicately as did King Agag. If money rates were to become lighter, this would have at least a sympathetic effect upon prices, and stimulate reinvestment, now that the New Year has turned, of surplus money no longer required to be retained in banking accounts against income tax and other seasonal payments.

Home Electricity Shares

The newspapers have been publishing their annual lists of comparative prices, showing the dolorous falls, in most cases, which have occurred during the past twelve months. In these lists, one of the few gratifying features is the strength of prices in the London electricity supply section. These prices, set out in the ELECTRICAL REVIEW of New Year's Day, showed the decline to have been negligible, a result which cannot fail to bring satisfaction to people who had invested their money into home electricity supply shares as being amongst the soundest industrials to which capital can be applied. The week's changes comprise a couple of falls, of 6d. each, in Clyde Valley and Lancashire Light and Power ordinary, reducing these to the common price of 24s. 6d.

Electricity Companies' New Shares

Dealings started a few days ago in the new shares issued by the Metropolitan Electric Supply Company, in accordance with the policy pursued by the majority of the London companies, of capitalising part of their reserves and by the issue to shareholders of fresh shares by way of bonus. The Metropolitan issue takes the shape of one new share in every twenty-five old. The price of the new shares is about 35s. 6d. The old shares are quoted at 37s. 6d., ex the rights to the new issue, but cum the final dividend for 1931, which latter the new issue does not share. After the payment of this dividend, and the quotation of the old shares ex dividend, old and new will rank equally. There will be a lively market for the next few weeks in the new shares that will be allotted by the London electricity



The stand of the Record Electrical Co., Ltd., at the Physical Society's Exhibition

supply companies to their proprietors, and the prices of the new will move in fairly strict relationship to those of the old shares.

The Westminster Electric Company has also issued its new shares, the proportion being one new for eight old. The old shares are accordingly quoted at 25s. 6d., ex rights, and the price of the new shares is 24s. middle, the new issue not being entitled to the final dividend for 1931. Amongst other electricity supply companies that will be issuing new shares very shortly are the Brompton, Charing Cross, Chelsea, City of London, Kensington, London and St. James'.

Regarding Allotment Letters

It may be of practical service to direct the attention of shareholders in London electricity supply companies to the need for preserving the papers which relate to allotment of their new shares. Cases have already occurred in which shareholders have thrown away their allotment letters, regarding them as being of no value, and failing to understand the bonus now offered. The destruction of an allotment letter does not, of course, nullify the allotment nor the shareholder's right to the shares, but it will give a good deal of trouble later on. Moreover, if the shareholder cares to sell his new shares, he will be able to do so at a price giving him a useful bonus. If the companies' communications are thrown away, this means a loss of the renunciation attached to the circulars, although, if the position is realised in time, the companies will probably issue duplicate letters upon being furnished with the required indemnities.

Home Railway Stocks

Approach of the dividend season, and the uncertainties which this involves, have combined to render the Home Railway market erratic and spasmodic. There has been a decidedly better tendency in the stocks of the steam companies, but those of the electric railways show no changes since the beginning of the year. Interest in this group is confined mainly to Underground Electric ordinary shares, where the yield on the money, £8 8s. per cent., offers attraction to the speculative investor who is able to take a moderate amount of risk, and who appreciates the extension of which London traffic is capable under private enterprise. The London Passenger Transport Bill is, of course, a factor in the situation which the speculator has to take into account when calculating the chances offered by the future.

The Metropolitan Railway Company is opposing the Bill, but has announced that it is prepared to agree to the provisions on condition that the company shall not be subject to the control of the board. The Metropolitan Railway wishes to be treated in the same way as the main-line railway companies. The Underground group, after going into the matter very carefully, and arranging many meetings between their directors and the late Government, gave their acquiescence, with the stipulation that their stockholders should receive an income from the new body that should be practically equivalent to that which they—the stockholders—at present receive. Tillings and the independent omnibus companies continue to oppose the Bill.

Underground Electric Railway 6 per cent. income debenture stock is better at 96½.

Dollar Stocks

Mexican Light and Power common shares are flat, having fallen 5 points to 15. The company's 5 per cent. first mortgage bonds gained the fraction at 60½, and Mexico Tramways 5 per cent. bonds rose 2 to 37½. Brazilian Tractions are ½ lower at 13½. The prices of a good many fixed-interest stocks and shares have been quoted ex dividend this week.

Cables and Wireless

The market for telegraph and telephone stocks is dull, although the Cables and Wireless group provides a somewhat unusual exception. The 5½ per cent. preference at 48½ is a point better on the week. Great Northern Telegraphs, however, have fallen £1 to 19½. Marconi Marines gave way to 32s. 6d., in spite of the expectation that negotiations will be consummated between the company and the Trawlers' Association whereby the scope of marine wireless communication would be extended to trawling ships. The Anglo-American list is disposed to be heavy. American Telephone and Telegraph shares have receded to 165. International Telegraphs are 11½.

Manufacturing and Equipment

So few are the price alterations in the list of shares comprised in the manufacturing and equipment group that it may be said the only change of note is a fall of 3/16 in Henley's ordinary shares, which has reduced the price to 4¾. On the other hand, Henley's 4½ per cent. preference shares, of £5 each, are ¼ up, at 4¼. India-Rubber 5 per cent. debenture stock advanced to 90½. The rest of the market has undergone practically no movement during the past fortnight. A fair amount of business is in progress, Johnson & Phillips and Siemens both being active. Attention is now directed to the final dividends which the companies are likely to pay in respect of 1931. The iron and steel list continues dull, in spite of the increasing demand for the imposition of some kind of tariff upon the imports of raw materials. Babcock & Wilcox shares have receded to 43s. 9d. Vickers keep in the close vicinity of 8s., and others in this department are inclined to be dull. The price of rubber receded to 3d. per lb., and caused a slight falling-away of rubber share values.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1929.	1930.	Price, Jan. 5, 1931.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES						
Bournemouth and Poole		15	15	57/6	—	5 4 4
Brompton Ordinary		8½	8½	27/6	—	5 1 0
Central Electricity 4½% Deb.	Stock	—	4½	82½	—	5 9 1
Charing Cross Ordinary	1	8½	8½	29/–	—	4 16 7
Chelsea	1	8½	8½	26/–	—	5 7 8
City of London	1	10	10	34/6	—6d.	5 16 0
Clyde Valley	1	8	8	30/9	—	5 4 1
County of London	1	11	11	43/3	—	5 1 7
Edmundsons' 7% Pref.	1	7	7	23/6xd	+6d.	5 19 2
Elec. Supply Corporation	1	11	11	41/3	—	5 6 6
Kensington Ordinary	1	8	8	29/–	—	4 16 7
Lancs. Light and Power	1	7	6½	24/6	—6d.	5 6 0
London & Home Counties 4½% Deb.	Stock	—	4½	85xd	—	5 6 0
London Electric	1	8½	9	33/–	—	5 9 1
Metropolitan	1	9	10	37/6	—	5 3 3
Midland Counties	1	6½	7	26/3	—	5 6 8
Mid. Elec. Power	1	15	8	28/9	—	5 11 4
Newcastle-on-Tyne Ordinary	1	6	6	23/3	—	5 3 3
Do. 7% Pref.	1	7	7	26/–	—	5 7 8
Notting Hill 6% Pref.	10	6	6	10½xd	+½	5 14 3
North Met. Elec. 6% Pref.	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	1	8	8	29/–	—	4 16 7
Scottish Power	1	8	8	27/–	—	5 18 6
South London	1	8½	8½	25/6	—	5 9 8
Urban Ordinary	1	7	7	27/–	—	5 3 8
Westminster Ordinary	1	8½	8½	25/6xd	—	5 9 10
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/6	—	7 6 4
Yorkshire Elec.	1	8	8	30/9	—6d.	5 4 1
HOME RAILS						
Central London Ord. Assented	Stock	4	4	68½	—	5 16 10
Metropolitan	,,	4	3½	35½	—	9 17 2
Do. District	,,	5	5	60½	—	8 5 4
Underground Electric	1	8	8	19/–	—	8 8 6
TELEGRAPHS AND TELEPHONES						
Anglo-Am. Tel. Pref.	Stock	6	6	92	—½	6 10 5
Do. Def.	,,	1½	1½	22	—	6 16 4
Cables & Wireless 5½% Pref.	Stock	5½	5½	48½	+1	—
Do. A 7½% Ord.	,,	Nil	—	17	—	—
Do. B Ord.	,,	Nil	—	10	—	—
Globe Tel. and T. Ord.	10	10	8½	8	—	—
Do. do. Pref.	10	6	6	7½	—	8 0
Great Northern Tel.	10	20	20	19½	—1	10 5 4
Marconi-Marine	1	15	15	32/6	—9d.	9 4 8
Oriental Telephone Ord.	1	12	12	2½	—	*5 16 0
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	5½	—	6/3	—	—
Do. do. 2nd Pref.	5	6	—	6/3	—	—
Do. do. 5% Deb.	Stock	5	5	12½	—	—
British Electric Traction Def. Ord.	,,	5	5	700	—	—
Do. do. Pref. Ord.	,,	8	8	112	—½	7 2 10
Brazil Traction	100	8	—	13½	—½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	86	—2	5 16 3
London & Sub. Trac. 5% Pref.	1	Nil	Nil	8/3	—	—
London United Tram Deb.	Stock	4	4	55½xd	—	7 4 2
Mexico Trams, 5% Bonds	—	5	5	37½	+2½	13 6 8
Mexican Light Common	100	Nil	Nil	15	—5	—
Do. 7% Pref.	100	7	7	25	—	20 0 0
Do. 1st Bonds	—	5	5	60½	+½	8 5 4
Victoria Falls Ord.	1	15	15	54/6xd	—	5 10 1
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—
MANUFACTURING COMPANIES						
Assoc. Elec. Ord.	1	6	6	1	—	6 0 0
Do. Pref.	1	8	8	27/–xd	—	5 18 5
Babcock & Wilcox	1	15	14	43/9	—¼	*6 7 10
British Aluminium Ord.	1	10	10	23/9	—	8 8 5
British Insulated Ord.	1	15	15	2¾	—	5 14 3
Brush Ord.	Stock	10	5	70	—	7 2 10
Callender's	1	15	15	2½	—	6 0 0
Do. 6½% Pref.	1	6½	6½	22/6xd	—	5 15 5
Crompton Parkinson Ord.	5/–	30	30	18/9xd	—	8 0 0
Do. 8% Pref.	1	8	8	26/3	—	6 2 0
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	90xd	—	5 11 1
Electric Construction	1	5	Nil	10/–	—	—
Enfield Cable Ord.	1	25	25	3¾	—	6 8 10
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	7/6	—	—
Ferranti Pref.	1	7	7	20/9xd	—	6 15 0
G.E.C. Pref.	1	6½	6½	23/–	—	5 13 1
Do. Ord.	1	14	10	42/–	—	4 15 3
Henley's	1	30	30	4¾	—3/16	6 6 5
Do. 4½% Pref.	5	4½	4½	4	—	5 12 6
India-Rubber	1	Nil	Nil	6/3	—	—
Johnson & Phillips	1	10	10	23/9	—	8 8 5
Siemens Ord.	1	7½	7½	20/–	—	7 10 0
Telegraph Construction	12	10	7½	12½	—	7 4 9

* Dividends paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1929

39,668. "Television apparatus." J. F. Gretton and F. H. Haskell. September 12th, 1930. (362,950.)

1930

16,181. "Electric switches." H. Garde. May 26th, 1930. (362,842.)

17,550. "Type printing telegraph systems." Exchange Telegraph Co., Ltd., and T. A. Kirton. June 6th, 1930. (362,951.)

23,726. "Control of electro-spinning and twisting machines having a separate flyer drive." Dr. H. Schneider. August 7th, 1930. (362,922.)

25,978. "Electrical indicating devices." Automatic Telephone Manufacturing Co., Ltd., and L. M. Simpson. August 30th, 1930. (362,926.)

26,170. "Electric time transmitters." F. Hope-Jones. September 2nd, 1930. (362,848.)

26,271. "Electrical translating devices such as loud-speakers." General Electric Co., Ltd., and D. A. Oliver. September 3rd, 1930. (362,959.)

26,281. "Electrically operated hand shears." E. Hoogland. September 3rd, 1930. (362,960.)

26,314. "Protective devices for transmission lines." British Thomson-Houston Co., Ltd. September 11th, 1929. (362,962.)

26,470. "Method of and means for extinguishing an alternating current arc." Siemens-Schuckertwerte Akt.-Ges. December 17th, 1929. (362,963.)

26,520. "Arrangement for preventing arcing back in mercury-vapour rectifiers." Akt.-Ges. Brown Boveri et Cie. September 9th, 1929. (362,931.)

26,546. "Method of damping the mechanical oscillations of overhead electric conductors." Siemens-Schuckertwerke Akt.-Ges. March 22nd, 1930. (362,932.)

26,567. "Electrical cut-outs." W. J. Davy. September 5th, 1930. (Cognate application 36,148/30 and 33,043/31.) (362,903.)

26,638. "Combined gas-electric water-heater." W. L. Livingstone. September 6th, 1930. (362,904.)

26,759. "Telephone or like signalling systems." Electrical Research Products Inc. September 10th, 1929. (362,858.)

26,970. "Receivers for frequency-modulated wave transmissions." J. Robinson and British Radiostat Corporation, Ltd. September 9th, 1930. (362,914.)

27,127. "Electric telegraphs." Standard Telephones and Cables, Ltd., and E. K. Sandeman. September 11th, 1930. (362,942.)

27,129. "Electric telegraphs." Standard Telephones and Cables, Ltd., L. H. Webb and S. H. Boss. September 11th, 1930. (362,943.)

27,131. "Telegraph printing and like apparatus." All America Cables Inc., and R. G. Griffith. September 11th, 1930. (362,944.)

27,139. "Traffic controlling apparatus for railways and the like." A. G. Kershaw and Westinghouse Brake & Saxby Signal Co., Ltd. September 11th, 1930. (362,946.)

27,334. "Manufacture of electron-emission tubes." A. Fevre. September 12th, 1930. (362,984.)

27,355. "Electrodes for use in electrolysis." A. Carpmael (I.G. Farbenindustrie Akt.-Ges.). September 12th, 1930. (362,988.)

27,905. "Protective equipment for electrical distribution systems." Westinghouse Electric & Manufacturing Co. September 18th, 1929. (363,005.)

28,332. "Hygienic cover for the mouthpieces of telephones and the like." E. M. Brown and S. Constanduros. September 22nd, 1930. (363,013.)

28,417. "Clamps for supporting and clamping overhead electrical conductors." Steatite & Porcelain Products, Ltd., and C. R. Lown. September 23rd, 1930. (363,015.)

28,555. "Resistance device." Vega Laboratories Corporation. April 4th, 1930. (363,017.)

28,767. "Welding of manganese steel, and electrodes for use therein." Quasi-Arc Co., Ltd., and E. F. Newell. September 25th, 1930. (363,018.)

29,631. "Fluid-tight electrical connections particularly applicable to oil-immersed electrical apparatus." P. Gaige. October 7th, 1929. (363,024.)

31,249. "Interlocking means between isolating switches and the casings of switchgear and the like connected thereto." Brookhirst Switchgear, Ltd., and C. Lanceley. October 18th, 1930. (363,045.)

31,250. "Electric motor starters." Brookhirst Switchgear, Ltd., and C. Lanceley. October 18th, 1930. (363,046.)

32,455. "Electric tumbler switches." J. A. Crabtree. October 29th, 1930. (363,060.)

32,796. "Bearing arrangements for high-speed electric motors." Allgemeine Elektricitäts-Ges. October 31st, 1929. (363,063.)

33,812. "Squirrel-cage rotors for small electric motors." Siemens-Schuckertwerke Akt.-Ges. December 2nd, 1929. (363,082.)

33,820. "Thermionic tubes." Arcturus Radio Tube Co. December 2nd, 1929. (363,084.)

34,094. "Coin-freed electricity meters." Landis & Gyr Soc. Anon. November 20th, 1929. (363,087.)

34,541. "Luminous electric discharge tubes." General Electric Co., Ltd. January 11th, 1930. (363,092.)

34,672. "Electric stop-motions for drawing-frames." W. J. Scott. November 18th, 1930. (363,096.)

35,167. "Formed half coils for the excitation of rotating field-magnets of dynamo-electric machines." F. Punga and H. Roos. November 22nd, 1929. (363,102.)

35,477. "Photo-electric apparatus." British Thomson-Houston Co., Ltd. November 26th, 1930. (363,103.)

36,755. "Manually and automatically controlled electric switches." British Thomson-Houston Co., Ltd. December 5th, 1929. (363,121.)

37,729. "Automatic or semi-automatic telephone systems." Coventry Automatic Telephones, Ltd., and J. E. Collyer. December 15th, 1930. (363,129.)

38,318. "Starting mechanism for synchronous motor clocks." Sangamo Electric Co. August 18th, 1930. (363,136.)

38,581. "Manufacture of magnetos and ignition systems for internal-combustion engines." Fabrica Italiana Magneti Marelli. December 24th, 1929. (363,141.)

1931

1,054. "Voltage measuring arrangements." Telefonaktiebolaget L.M. Ericsson. January 14th, 1930. (363,165.)

1,347. "Protective switches." Schiele & Bruchsaler-Industriewerke Akt.-Ges. January 14th, 1930. (363,171.)

1,357. "Emergency electric lighting apparatus." Britannia Batteries, Ltd. February 5th, 1930. (363,172.)

1,448. "Quick-action electric switches." A. Page and E. W. Bennett. January 15th, 1931. (363,175.)

1,615. "Electricity meters." Siemens Bros. & Co., Ltd., and C. R. Riber. January 17th, 1931. (Addition to 310,390.) (363,178.)

2,777. "Method and apparatus for use in making X-ray photographs." C. H. F. Muller Akt.-Ges. April 24th, 1930. (Addition to 339,215.) (363,194.)

3,795. "Electric generator brushes." J. W. Record and Record Electrical Co., Ltd. February 6th, 1931. (363,212.)

4,462. "Radio and similar high-frequency receivers." Marconi's Wireless Telegraph Co., Ltd. February 12th, 1930. (362,243.)

5,036. "Electric switches particularly for the starting motors of automobiles." Ford Motor Co., Ltd. March 12th, 1930. (363,221.)

5,137. "Electric hair wavers." S. Kallmann. April 10th. 1930. (362,249.)

5,433. "Temperature sensitive electrical circuit closers." G. H. Brady. February 20th, 1931. (363,226.)

5,543. "Modulators for carrier wave signalling." Telefonaktiebolaget L. M. Ericsson. February 24th, 1930. (362,252.)

5,827. "Reflector systems for use with short Hertz waves." Telefunken Ges. für Drahtlose Telegraphie, and W. Ludenia. February 25th, 1930. (362,254.)

6,223. "Electrostatic loud-speaker circuits." H. Vogt. March 7th, 1930. (362,259.)

6,353. "Method of and apparatus for hard soldering and welding metals by means of electrically generated heat." W. Schabelitz. February 28th, 1930. (363,239.)

7,562. "Wireless receiving apparatus." C. Lorenz Akt.-Ges. March 11th, 1930. (362,270.)

7,673. "Thermionic valves." Telefunken Ges. für Drahtlose Telegraphie. March 27th, 1930. (362,272.)

8,033. "Loud speakers, microphones, or like apparatus for transforming electric vibrations into sounds, and vice versa." J. Bethenod. April 12th, 1930. (362,277.)

8,069. "Loudspeakers." E. Breitenborn. March 19th, 1930. (362,279.)

8,354. "Electric thermal relays." British Thomson-Houston Co., Ltd. March 18th, 1930. (363,247).

8,796. "Electrical precipitation of suspended particles from gaseous fluids." Lodge-Cottrell, Ltd. (International Precipitation Co., Inc.). March 21st, 1931. (362,290.)

10,522. "Mercury arc rectifiers." International General Electric Co., Inc. April 9th, 1930. (363,258.)

10,692. "Switch control means for vehicle lamps." R. Bosch Akt.-Ges. May 1st, 1930. (Addition to 332,856.) (363,259.)

11,027. "Electric discharge devices." British Thomson-Houston Co., Ltd. April 14th, 1930. (362,303.)

11,183. "Cooled tanks or casings, particularly for oil-immersed electrical apparatus." British Thomson-Houston Co., Ltd. April 15th, 1930. (363,263.)

12,076. "Sparking-plugs for explosion motors." G. Herbaux. April 23rd, 1930. (363,271.)

12,910. "Telephone systems employing selectors." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges.). May 1st, 1931. (363,273.)

13,712. "Low-frequency amplifiers." Allgemeine Elektricitäts-Ges. May 8th, 1930. (362,319.)

14,016. "Electromagnetic pick-ups." Ideal Werke Akt.-Ges. für Drahtlose Telephonie. May 14th, 1930. (362,321.)

14,781. "Suspension devices for electrical cables." A. E. Hughes and Liverpool Electric Cable Co., Ltd. May 19th, 1931. (363,279.)

16,360. "Electric current leads-in for electrically heated liquid containers." L. Mellersh-Jackson (Siemens Schuckertwerke Akt.-Ges.). June 4th, 1931. (363,286.)

16,362. "Methods of and apparatus for recording sound and sound-records." Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). September 4th, 1930. (Divided application on 26,467/30.) (362,993.)

16,755. "Electrodes for electrolytic apparatus." Kabushika Kaisha Hitachie Seisakusho. June 9th, 1930. (363,289.)

17,588. "Electric control systems." International General Electric Co., Inc. June 17th, 1930. (363,292.)

30,830. "Electrically operated hand shears." E. Hoogland. September 3rd, 1930. (Divided application on 362,960.) (362,949

30,831. "Electrically operated hand shears." E. Hoogland. September 3rd, 1930. (Divided application on 362,960.) (362,994.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from December 30th, 1931:—

Dowsing's (lettering and design). No. 523,775. Class 13. Milk heating containers, immersion heaters, flat irons, &c., all being electrically heated. No. 523,776. Class 18. Radiators, grills, hot plates, &c., all being electrically heated.—Dowsing Radiant Heat Co., Ltd., 91-93, Baker Street, W.1.

Le Scialytique (lettering and design). No. 526,284. Class 13. Electric lamps (ordinary) and lanterns, all for use in operating theatres.—La Société des Anciens Etablissements Barbier, Benard & Turenne, Paris. (British representatives: Lloyd, Wise & Co., 10, New Court, Lincoln's Inn, W.C.2.)

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barnard Castle (DURHAM).—Alterations to the Unitarian Chapel; R. Wylie, architect.

Barrow.—Flats (56), Roosgate (£15,907); P. A. Baines & Sons, Ltd., Kendal. Mineral water factory, Duke Street; Marsh & Sons. Alterations to Electric Theatre, Buccleuch Street; licensee. Stores, Dalton Road and Scott Street; Marks & Spencer, Ltd.

Bedford.—Extensions to premises, Willows Road, for the Utility Service Laundry; C. Burley, builder, Stagsden Road.

Bexhill-on-Sea.—Houses, Little Common Road, Cooden Drive and London Road; A. E. Lewis, J. E. Maynard and T. Skinner.

Bicester (OXON).—Houses (28) for the U.D.C.; Parker & Sons, builders, Marsh Gibbon.

Birmingham.—Houses (41), Appian Way; Bourneville Village trustees. Reconstruction of salvage depôt, Rotton Park Road (£17,000); city engineer. Enlargement of Yarnfield Road School (£5,600) for the E.C.

Bolton.—Booking offices and waiting rooms, Moor Lane Motor Park; borough engineer.

Brentford.—Office extensions for Chiswick Products, Ltd., Burlington Lane; A. A. H. Scott.

Brighouse (YORKS).—Re-erection of Broadholme Mills, Atlas Mill Road (£8,000); proprietors.

Bristol.—Station, Bedminster (£10,000); W. T. Nicholls, Ltd., builders, Gloucester.

Bury.—Conversion of premises into Town Hall (£25,000); borough engineer.

Chatham.—Central school for the borough E.C.; director of education.

Chelmsford.—Church, Swiss Avenue, for the Church of Ascension; Rev. J. H. Morgan.

Chesterfield.—Central baths; borough surveyor.

Consett (DURHAM).—Houses for the U.D.C.; surveyor, Council offices.

Coventry.—Bank premises, Greyfriars Lane, for Lloyds Bank Ltd., London, E.C.3; Buckland & Haywood, architects. Norwich Union Chambers, Congreve Street, Birmingham. Elementary school, Moseley Avenue (£17,000) for the E.C.

Dorset.—Re-organisation of laundry, Weymouth Institution, for the C.C.; county architect, Dorchester.

Dudley.—Shops, New Street; borough engineer.

Durham.—X-ray apparatus for the County Hospital.

Easington (DURHAM).—Mining institute (£5,000); Hayes & Gray, architects, Camden Street, North Shields.

Eastbourne.—Rebuilding business stores for Dale & Kerley, Ltd., Terminus Road and Seaside Road.

Edinburgh.—Houses (154) and shops at Niddrie Mains for the Corporation, and extensions to East and West wing of the City Chambers; E. J. MacRae, city architect. Extensions to the Royal Infirmary, Lauriston Place; T. W. Turnbull, architect, Lonsdale Terrace.

Essex.—Two senior schools, Rochford area, for the county E.C.; director of education, Chelmsford. Junior school, Chase Lane, Chingford, and extensions to London Road School, Romford (£1,327); county architect.

Gloucester.—Block of shops, King's Square (£10,000); W. T. Nicholls, Ltd., builders.

Grantham.—Omnibus station (£8,000); borough engineer.

Hamilton.—Extensions, carpet factory, Bertram Street, Burnbank, for A. Stevenson & Son.

Hanley.—St. Matthew's Church, Birches Head; Watkins & Maddox, architects, Burslem.

Harrow (MIDDLESEX).—Houses (42), Rossall Avenue and Cleveleys Avenue; R. Lancaster & Son, Ltd., builders, 125, High Road, Wembley.

Hastings.—Reconstruction of White Rock baths for the T.C.; S. Little, borough engineer.

Hetton-le-Hole (DURHAM).—Houses (100) for the U.D.C.; A. H. Fennell, architect.

Horley (SURREY).—Houses (24) and flats (16) for Reigate R.D.C.; surveyor.

Hull.—Houses (21) and shops (5), Ring Road and Beverley Road; Mr. E. Batty. Houses (38), Willerby Road; H. Needler. Houses (20), Wymersley Road; S. Etherington. Showrooms and garage, Anlaby Road; Gordon Armstrong (Hull), Ltd. Alterations and additions, Palace Theatre, Anlaby Road; Moss Empires, Ltd. Three Catholic churches, Willerby Road, Endyke Lane and Calvert Road; Rollitt & Farrell. Extensions to Station Hotel; L.N.E. Railway. Waterworks and pumping station (£70,000); water engineer.

Irish Free State.—(LONGFORD).—Houses (50) for the U.D.C.

Kent.—School, St. Paul's Cray, for the county E.C.; director of education, Maidstone.

Knaresborough (WEST RIDING).—Internal renovations to Public Assistance Institution; architect, County Hall, Wakefield.

Knutsford.—Extensions to paper mills for the Waterproof Paper Co., Ltd.; A. Clayton, architect, Duchy Chambers, 4, Clarence Street, Manchester.

Lampeter (CARD).—Rebuilding business premises for B. J. Jones, City House, College Street.

Lancashire.—Library, Morecambe (£15,000), for the county E.C.; director of education, Preston.

Leatherhead.—Municipal offices (£17,000); U.D.C., surveyor.

Leeds.—Extension of Crossgates Wesleyan Church; trustees.

Leyburn (YORKS).—Sewage works extensions; F. J. Rodwell, chartered engineer, 37, Prudential Buildings, Park Row, Leeds.

Lincoln.—Wesleyan School Chapel, St. Giles Estate; Gelder & Kitchen, architects, 120, Alfred Gelder Street, Hull.

Liverpool.—Housing schemes, Dovecot Estate (116) and 46 Knotty Ash Estate; director of housing, Municipal Annexe, Dale Street.

London.—(LEYTON).—Public baths (£110,000) for the T.C.; borough surveyor. (SOUTHGATE).—Flats (39) and garages (17), Grove House Estate; Duart, Elliott & Co. Development of Broadfields Estate; O. H. Cockrill. (WEST HAM).—Extensions and alterations to business premises, Queen's Road; F. Kinch & Sons, builders, 205, St. Mary's Road, E.13.

Long Sutton (LINCS).—Block of business premises, Market Street, for Christian & Dobbs.

Luton (BEDS).—Works extensions for Vauxhall Motors, Ltd. (£14,000); Luton Building Co., Church Street.

Mablethorpe (LINCS).—Sewage scheme, with pumping station (£40,000), for the U.D.C.; W. Wright & Son, Ltd., contractors, Lincoln.

Maidstone.—Houses (138), Ringlestone Farm Estate, for the T.C.; Cox Bros., builders.

Malton (YORKS).—Alterations to post office, &c.; H.M. Office of Works, King Charles Street, S.W.1.

Manchester.—Houses (116), South Manchester; Corporation housing director. Schools, East and West Wythenshawe Estates; director of education, Education Offices, Deansgate.

Mansfield.—Re-erection of automobile works, Clumber Street, for H. Pye & Sons.

Morpeth (NORTHUMBERLAND).—Buildings for mentally defective (£180,000); D. Balfour & Sons, engineers, 3, St. Nicholas Buildings.

Motherwell.—Sewage purification works, Lower Carbarns, Wishaw; burgh engineer, Town Hall.

Norwich.—Re-erection of portion of business stores (electrically equipped), Prince of Wales Road, for Willmott Bros.

Nuneaton.—Alterations and additions to the premises of the Co-operative Society at Bucks Hill and Merevale Avenue; H. H. Jepson, architect, Queen's Buildings, Stratford Street.

Otley (YORKS).—Extensions to factory, Leeds Road, for G. Harrison & Sons (Bradford), Ltd., 43, Hall Ings, Bradford; O. Holmes, architect, 41, Boroughgate.

Penistone (WEST RIDING).—Internal renovations to Public Assistance Institution; architect, County Hall, Wakefield.

Portsmouth.—Houses (410) and flats (38) (£170,000), Cosham; also reconstruction of interior of Guildhall; city engineer. Improvements to Arundel Street School (£2,500) and extensions to Portsdown School (£24,400) for the E.C.

Prestwich.—Synagogue and school, off King's Road, Sedgley Park, for the Jewish congregation; W. R. Sharp & Cowburn, architects, 40, South King Street, Manchester.

Repton (DERBY).—Church; rector of St. Mary's Church, Derby.

Ripon.—Alterations to the Institution; West Riding architect, County Hall, Wakefield.

St. Austell (CORNWALL).—Re-erection of Carlyon Bay Hotel, electrically equipped; J. Williams & Co., builders.

Scarborough.—Church, Burniston Road; vicar of Scalby. Clearance schemes, Cross Street and Dumple Street; borough engineer.

Selby (WEST RIDING).—Internal renovations of Public Assistance Institution; architect, County Hall, Wakefield.

Sheffield.—Mental institution, first section (£180,000); city architect. Branch stores, Prince of Wales Road; Brightside Co-operative Society, Ltd.

Slough (BUCKS).—Factory, Buckingham Avenue, for Slough Estates, Ltd.

Smethwick.—Houses (464) Warley Estate; borough engineer.

Somerset.—Senior school, Timsbury, for the county E.C.; county architect, Weston-super-Mare.

Southall.—Houses (78), Westbury Avenue; G. Wimpey & Co., Ltd. Hospital, Park View Road; Hospital Committee. Shops (15) and flats, Lady Margaret Road; Property Construction & Development Co.

Torquay.—Public library extensions; borough engineer.

Uttoxeter (STAFFS).—Houses (26) for the R.D.C.; surveyor.

Walsall.—Chapel, Stoke Street; Bethel Evangelistic Church Committee.

Warrington.—Re-erection of works, Woolston, for E. Gorton, Ltd.

Watford.—Extensions to Shrodells Institution (£8,700); Turner & Payne, North Finchley.

Worthing.—Houses, Lavington Road (40), and other roads (16); H. M. Potter.

York.—Development of building estate, Copmanthorpe; W. H. Bean. Additions to County Insurance Offices, Museum Street; J. Hetherton. Additions to training college, Lord Mayor's Walk; St. John's Diocesan trustees.

Wireless for Trawlers

An agreement has just been concluded between the Marconi International Marine Communication Co., Ltd., and the British Trawlers' Federation, Ltd., which should considerably extend the use of wireless in connection with the sea fishing trawler industry to the benefit of both concerns. Under this agreement, charges for wireless telegraph and telephone equipment supplied by the company to trawlers affiliated to the Trawlers' Federation will be reduced according to the number of trawlers fitted. At present about 300 are fitted with Marconi wireless apparatus.

The agreement is a further development of the policy adopted by the Marconi Marine Company when in the autumn of 1930 it entered into an agreement with the Chamber of Shipping and the Liverpool Steamship Owners' Association under which the company agreed to give a rebate of 6 per cent. to all shipowners undertaking to place at least 75 per cent. of their new wireless business with it for a period of five years. Over 90 per cent. of the company's clients entered into the agreement.